Exhibit A

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF VIRGINIA
Alexandria Division

United States of America, *et al.*,

Plaintiffs,

v.

Google LLC,

Defendant.

Case No. 1:23-cv-00108-LMB-JFA

Hon. Leonie H. M. Brinkema

EXPERT REPORT OF ROBIN S. LEE, PHD

December 22, 2023

I. Introduction

I.A. Qualifications

(1) I am an economist, specializing in the field of industrial organization. Industrial organization studies the structure and functioning of markets, and competition among firms. I received my undergraduate and graduate degrees from Harvard University, receiving my AB in Economics in 2003, my AM in Economics in 2005, and my PhD in Business Economics in 2008.

(2) I am a Professor of Economics in the Department of Economics at Harvard University and regularly teach courses in industrial organization to graduate and undergraduate students. Previously, I have served on the faculty at New York University's Stern School of Business where I taught MBA students. I have published thirteen articles in peer-reviewed journals, including the *American Economic Review, Econometrica,* and the *Journal of Political Economy.* My published work has examined issues related to competition in a variety of industries characterized by network effects. I have also coauthored a chapter covering empirical analysis of contracting in vertical markets that appeared in the most recent volume of the Handbook of Industrial Organization (Elsevier, 2021). I have served as a Co-Editor of the *American Economic Journal: Microeconomics* and as an Associate Editor of the *International Journal of Industrial Organization,* both of which are leading journals in the field of industrial organization.

(3) In my academic positions at New York University and Harvard University, I have supervised the thesis research and served on the dissertation committees of 25 economics PhD candidates. I have received several awards of recognition for my academic work, including the Econometric Society's Frisch Medal (an award presented biennially for the best applied paper published in *Econometrica*), the American Antitrust Institute's award for Best Antitrust Article on Mergers, and the Association of Competition Economics' Best Paper Prize.

(4) I have served as an economic expert on several antitrust matters in the past.

(5) My curriculum vitae is Appendix A to this report. It contains additional information about my professional experience, including my publications and prior testifying experience.

I.B. Scope of charge

(6) I have been retained by the United States Department of Justice on behalf of Plaintiffs in this case. Plaintiffs allege that the Defendant, Google, "has used anticompetitive, exclusionary, and unlawful

an ad tech product as it handles more transactions. Scale benefits can be reinforcing and lead to durable advantages over rivals over time.

(23) Next, having provided that background, I evaluate in **Section IV** the relevant antitrust markets alleged by the Plaintiffs. Defining relevant markets involves identifying a set of products over which a hypothetical monopolist could possess and profitably exercise significant market power. Market definition is a useful tool for analyzing monopolization claims, as it assists with the assessment of market power and helps focus attention on areas where potential competitive effects from the conduct at issue are most likely to occur.

(24) In this Section, I explain why *publisher ad servers*, *ad exchanges*, and *advertiser ad networks* for open-web display advertising are relevant product markets, where:

- *Publisher ad servers* are software products used by open-web publishers to manage and sell display ad "inventory" (i.e., website ad space), both through transactions that are directly negotiated with advertisers in advance, and through "indirect" transactions that are sold in "real-time" whenever a user visits a website and new display ad impressions become available for sale;
- *Ad exchanges* are software products that run real-time auctions for publishers' display ad inventory among advertisers; and
- *Advertiser ad networks* are software products that advertisers use to purchase display ad inventory from publishers.

(25) Figure 1, based on a June 2020 Google presentation, provides a simplified depiction of various ad tech products and the transactions that they facilitate. Publishers (i.e., sellers) are on the left-hand side, advertisers (i.e., buyers) are on the right-hand side, and ad tech products are in the middle. The diagram shows different sets of ad tech products, including those belonging to the relevant product markets: publisher ad servers, ad exchanges, and advertiser ad networks. The diagram also depicts Google's ad tech products.

II. Industry background

(47) In this section, I provide an overview of the role that advertising technology ("ad tech") products play in facilitating transactions for digital display advertising ("display advertising"). This discussion provides background for my analysis in this report.

- In Section II.A, I describe display advertising, how it compares to other forms of digital advertising, and different types of display advertising transactions.
- In Sections II.B and II.C, I discuss ad tech products that facilitate the sale of display advertising in more detail, and describe Google's products in this industry.
- In Section II.D, I describe how ad tech products typically charge fees to customers.
- In Section II.E, I describe how the sale of display advertising has evolved over time.

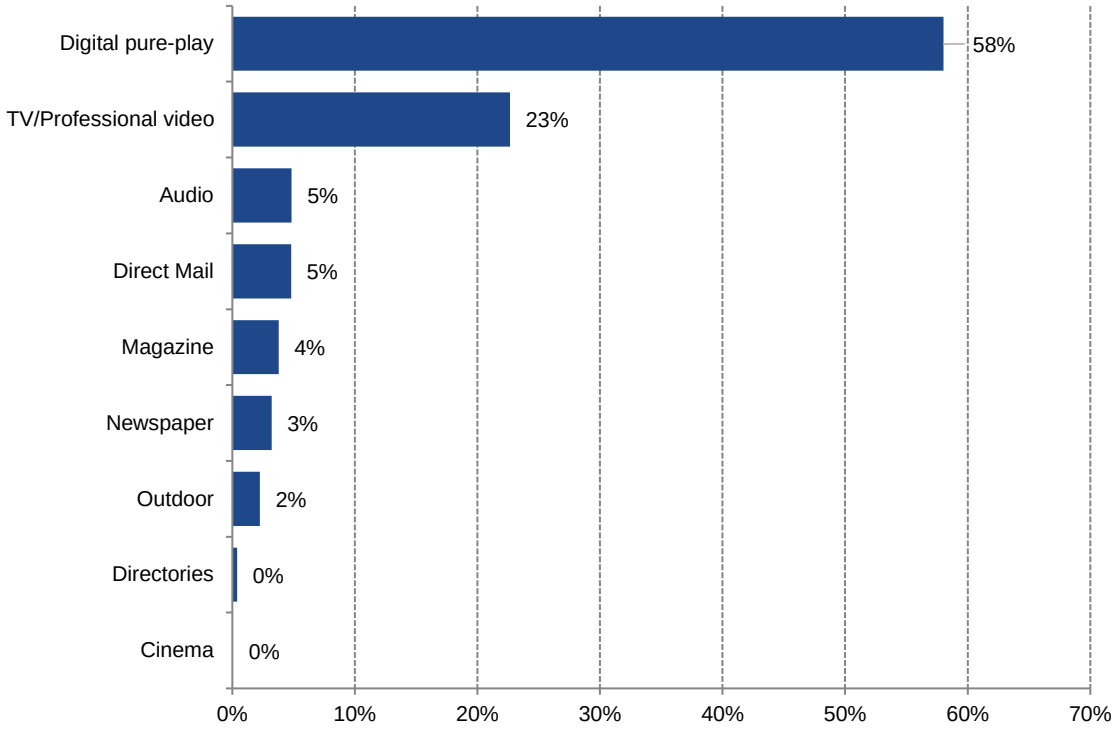
II.A. Digital display advertising

(48) Digital advertising, also referred to as online advertising, is the single largest type of advertising media by revenue both globally and in the United States.[7] Figure 3 below shows revenues for different advertising media in the United States in 2021. Spending on digital advertising has exhibited steady growth over the past decade. Figure 4 below shows trends in US and worldwide digital advertising spending from between 2011 and 2022.[8]

[7] According to data from eMarketer, a market research company, in the United States, digital advertising generated $221 billion in revenue in 2021 accounting for approximately 70% of all advertising revenue; globally, digital advertising generated $506 billion in revenue, representing 63% of all advertising revenue in 2021. Worldwide digital ad spending data (eMarketer) at tab "Total, Digital, and Mobile," rows 73, 86, 283, 296 (n.d.).

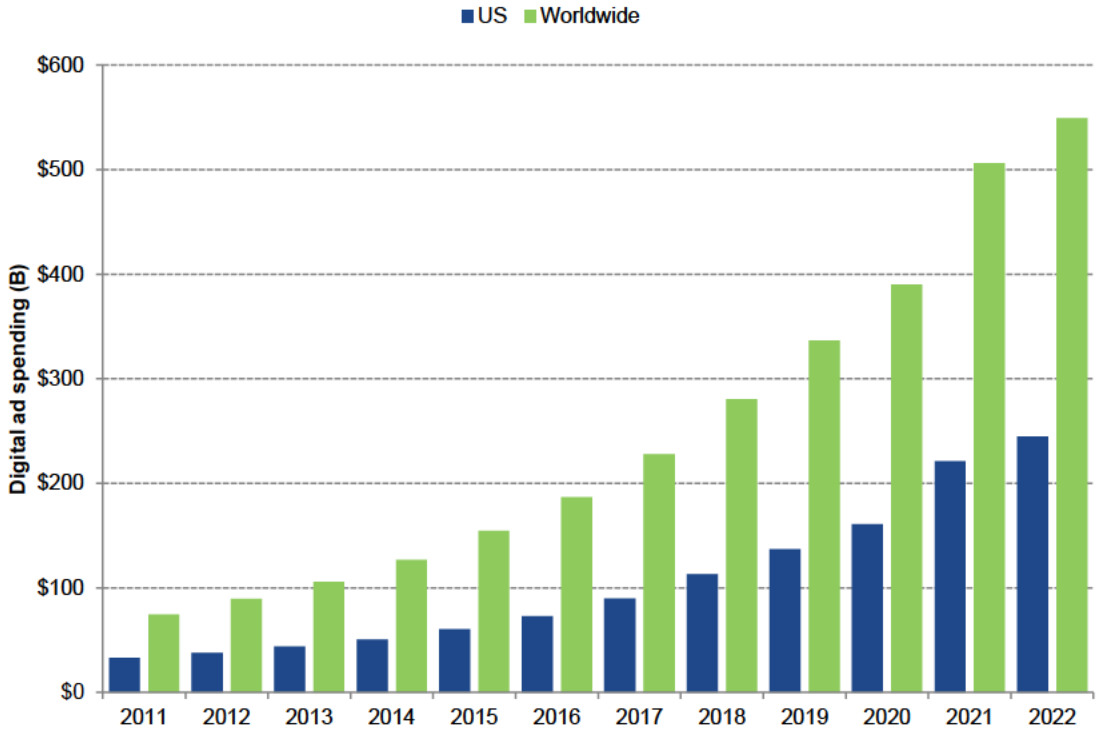
[8] Within digital advertising, spending on display advertising has also exhibited growth during this period. *See* Figure 78 in Appendix C.

Figure 3. Revenue share by type of advertising media in the United States (2021)



Source: GroupM, "This Year Next Year: 2022 Mid-Year Advertising Forecast", GroupM, June 2022, 40, https://d2ksis2z2ke2jq.cloudfront.net/uploads/2022/06/GroupM_TYNY_June2022.pdf. Digital "pure-play" refers to advertising on digital/online-only venues. Television/Professional Video includes standard and "connected" TV, which refers premium television content streaming from apps on a smart TV or an internet-connected ("over-the-top") device. *See* The Trade Desk, "Connected TV," The Trade Desk, accessed December 15, 2023, https://www.thetradedesk.com/us/our-platform/dsp-demand-side-platform/connected-tv.

Figure 4. [redacted]



Source: Worldwide digital ad spending data (eMarketer) at tab "Total, Digital, and Mobile," rows 73, 86 (2022)
Notes: Includes advertising that appears on desktop and laptop computers as well as mobile phones, tablets, and other internet-connected devices. Source: Worldwide digital ad spending data (eMarketer) at tab "Total, Digital, and Mobile," rows 73, 86 (2022).
Notes: According to eMarketer, a market research company, digital ad spending includes advertising that appears on desktop and laptop computers as well as mobile phones, tablets, and other internet-connected devices; and includes banner ads and other (static display ads such as Facebook's News Feed Ads and Twitter's Promoted Tweets), classified ads, email (embedded ads only), mobile messaging (SMS, MMS, and P2P messaging), rich media (including in-stream and outstream video ads), search ads (including contextual text links, paid inclusion, paid listings, and SEO), sponsorships, lead generation (referrals).

(49) Industry participants often divide digital advertising into different segments, including display, search, instream video, and native (as well as other smaller categories). I briefly describe these segments below:

1. **Display**: Digital display advertising refers to image or text-based advertisements (ads) that internet users see online.[10] Display ads include "banner ads," which the IAB, an online-

[9] [redacted]

[10] *See*, e.g., IAB, "Internet Advertising Revenue Report: Full-year 2022 results," https://www.iab.com/wp-content/uploads/2023/04/IAB_PwC_Internet_Advertising_Revenue_Report_2022.pdf. Display ads may include static images as well as "rich media," which can include video components. Google, "What is rich media?" Studio Help, accessed December 14, 2023, https://support.google.com/richmedia/answer/2417545?hl=en (Google defines rich media as "a digital advertising term for an ad that includes advanced features like video, audio, or other elements that encourage viewers to interact and engage with the content").). Videos that are contained as part of display ads (e.g., a video that is part of a banner ad at the top of a website) are referred to as "outstream" or "in-display" video

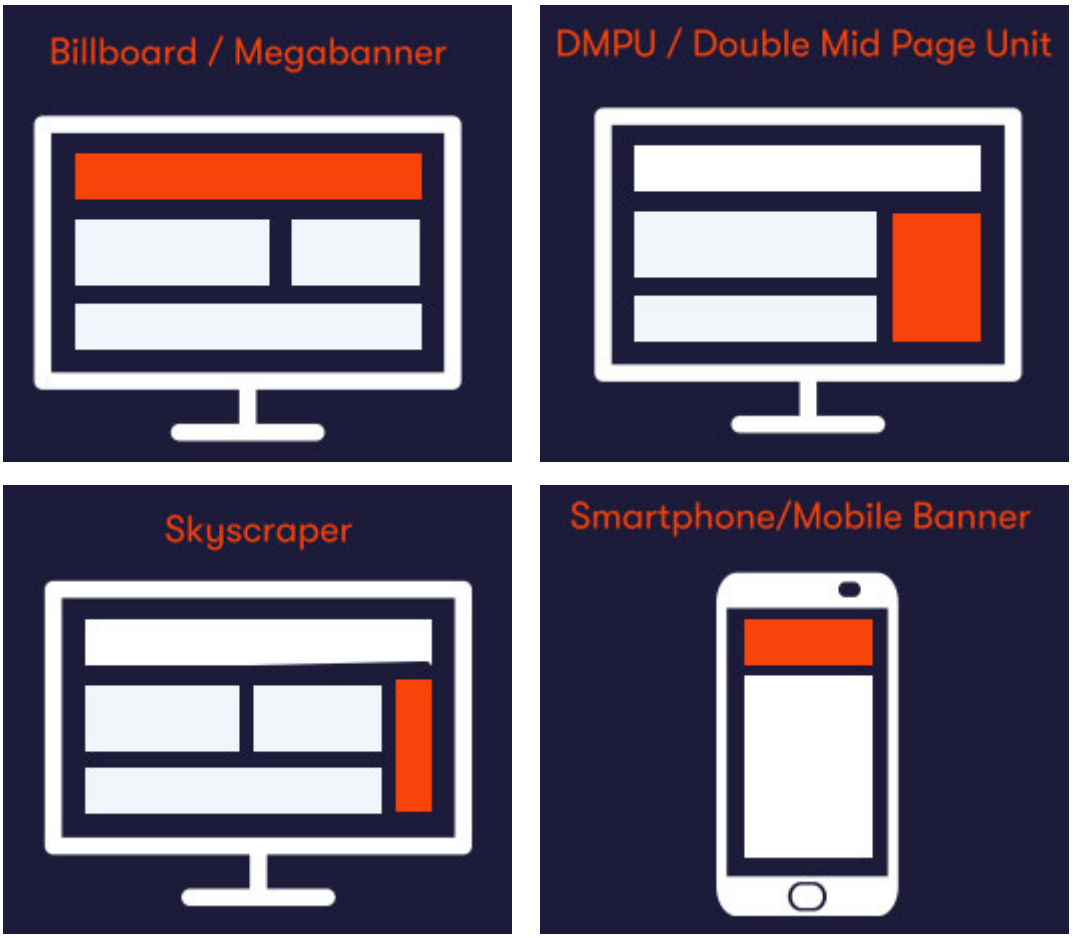
advertising trade organization, calls "one of the most dominant forms of advertising on the internet."[11] Display ads may include items such as text, images, video, audio, and often come in a set of predetermined formats and sizes.[12] Figure 5 below shows examples of common placements of display ads on websites and Figure 6 shows an example of how display ads may appear for a user when visiting two different websites.

advertisements. Video ads may also be shown in video players included on websites. These are referred to as "instream video" ads and may play before, during, or after dedicated video content. *See* Section II.A and Section IV for further discussion.

[11] IAB, "Internet Advertising Revenue Report: Full-year 2022 results," IAB, April 2023, p. 22 https://www.iab.com/wp-content/uploads/2023/04/IAB_PwC_Internet_Advertising_Revenue_Report_2022.pdf.

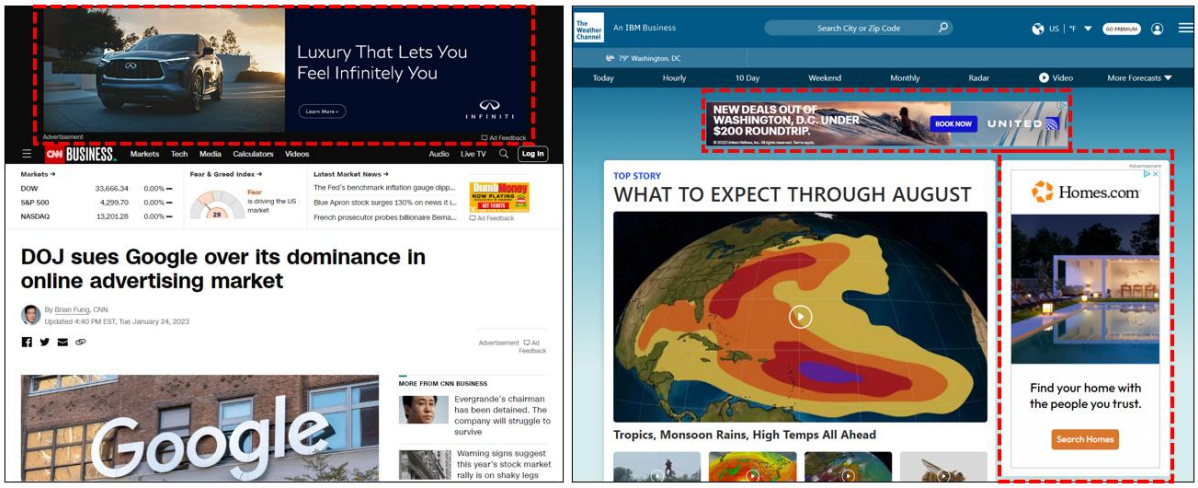
[12] IAB UK, "Jargon Buster," IAB UK, https://www.iabuk.com/jargon-buster?letter=33&title=&page=1. IAB UK, "Introduction to digital display advertising for media owners", IAB UK, last modified (06/June 2021), https://www.iabuk.com/sites/default/files/public_files/Introduction-to-digital-display-advertising-for-media-owners_0.pdf.

Figure 5. Examples of common display ad locations as specified by the Internet Advertising Bureau (IAB)



Source: IAB UK, "Introduction to digital display advertising for media owners", IAB UK, last modified (06/2021) https://www.iabuk.com/sites/default/files/public_files/Introduction-to-digital-display-advertising-for-media-owners_0.pdf.

Figure 6. Examples of display ads shown on websites



Source: CNN, captured September 29, 2023, www.cnn.com. The Weather Channel, captured July 31, 2023, www.weather.com.
Notes: Red dashed lines highlight display ads.

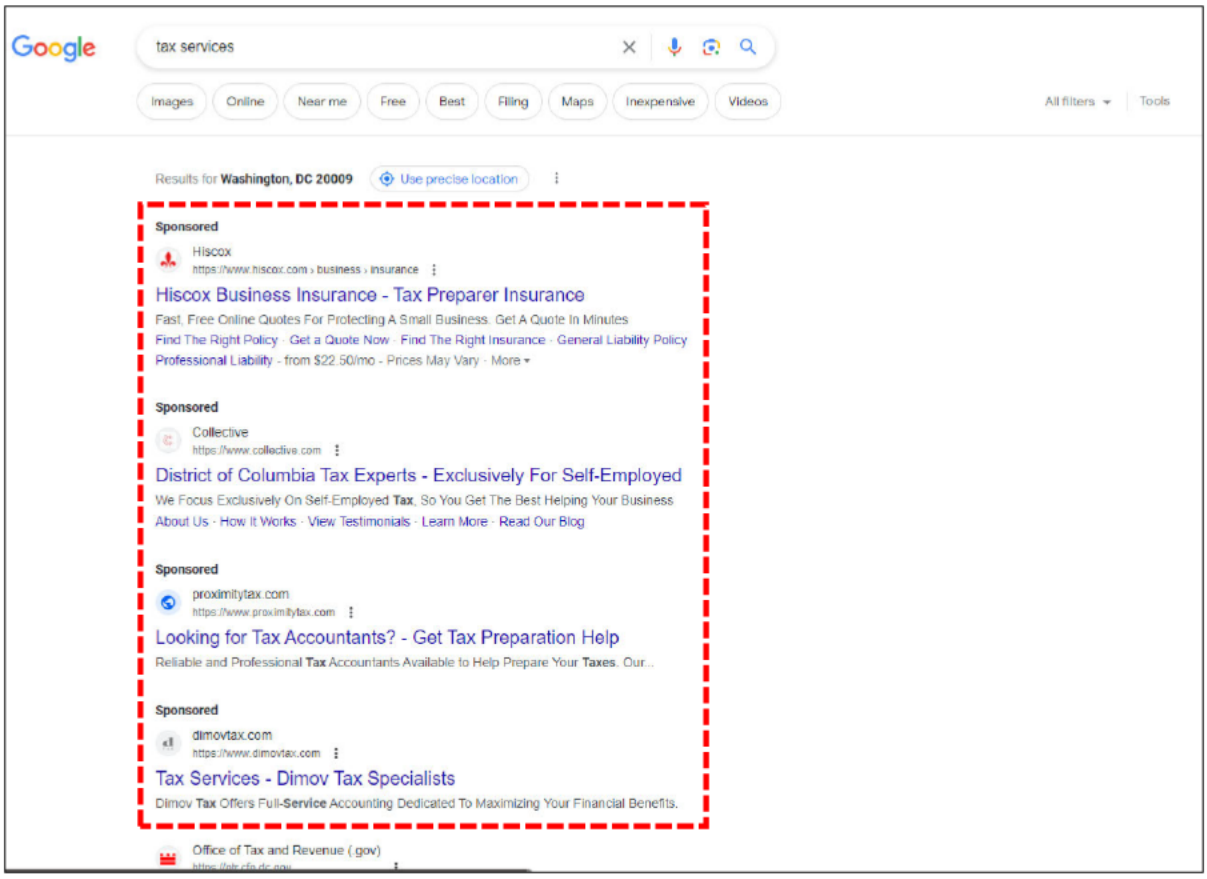
2. **Search**: Search ads are ads shown alongside search results from a search engine and are often linked to a certain search word or phrase. Advertisers generally bid on search advertising slots that are relevant to certain keywords[13] and pay for these advertisements on a cost-per-click ("CPC") basis.[14] These paid listings may appear as "sponsored" links at the top or side of search results.[15] Figure 7 below shows an example of how paid listings may appear alongside standard search results.

[13] Google, "The ad auction," Google Ads Help, accessed December 15, 2023, https://support.google.com/google-ads/answer/1704431.

[14] Google, "Actual cost-per-click (CPC): Definition," Google Ads Help, accessed December 15, 2023, https://support.google.com/google-ads/answer/6297?sjid=15864561118467767985-NA ("Your actual cost-per-click (actual CPC) is the final amount you're charged for a click.").

[15] IAB, "Internet Advertising Revenue Report: Full-year 2022 results," IAB, April 2023, https://www.iab.com/wp-content/uploads/2023/04/IAB_PwC_Internet_Advertising_Revenue_Report_2022.pdf, at 23. Google also distinguishes between search ads, display content, in-stream video content, and in-app ads. *See*, e.g., GOOG-DOJ-AT-02199478, at -485 (06/2019).

Figure 7. Examples of search ads



Source: Google, captured on August 30, 2023, www.google.com.
Note: Red dashed lines highlight search ads. Ads shown on the Google Search result page are identified with a "Sponsored" label at the top of the ad.

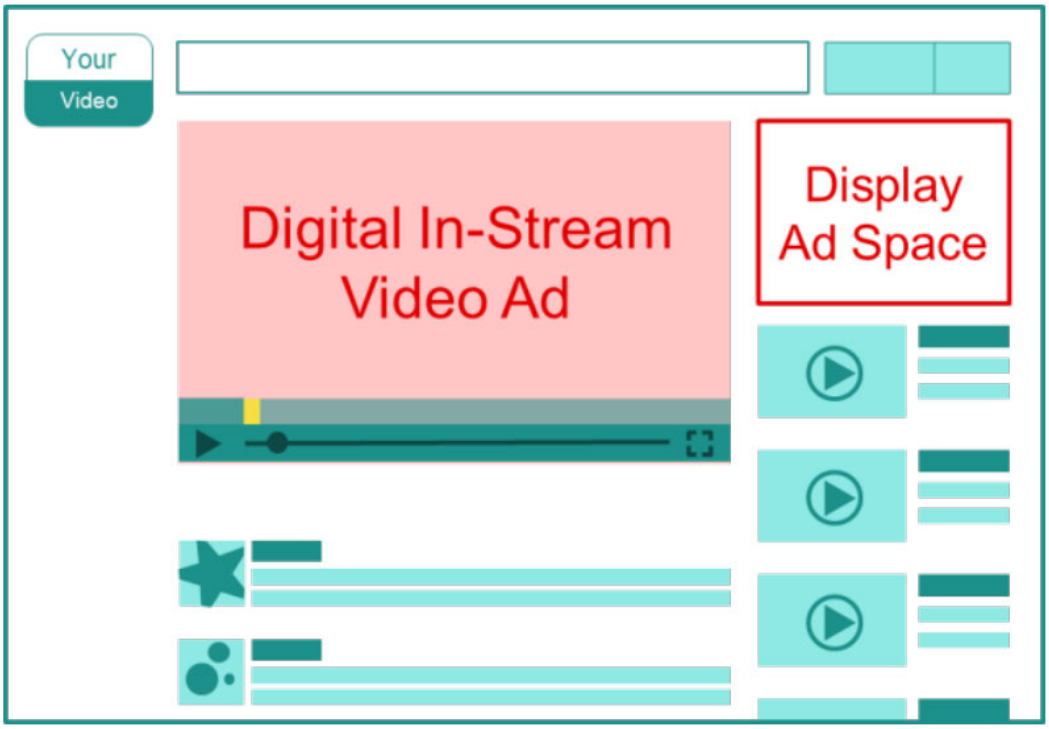
3. **Instream video**: Instream video ads are shown within a video player on a website, or in applications on mobile devices or connected TVs.[16] Instream video ads are viewed in a video player before, during, or after the original site's video content.[17] Instream video ads are distinct from "outstream" or "in-display" video ads, which are videos played in standard display ad

[16] IAB, "Definitions and Terminology," IAB, https://www.iabuk.com/ctv/glossary (defines connected TV as "[v]ideo content consumed on a TV screen, delivered via an internet connection. This includes TVs directly connected to the internet (Smart TV), as well as hardware that enables a TV to become connected, e.g. TV sticks, games consoles and set-top boxes that are connected to the internet.").

[17] IAB, "Digital Video In-Stream Ad Format Guidelines," Interactive Advertising Bureau (IAB), January 8, 2016, https://www.iab.com/wp-content/uploads/2016/01/DVAFG_2015-01-08.pdf, at 7 (defining digital video in-stream ads as "ad formats served into a video player: 'before, during, and after a variety of content including, but not limited to, streaming video, animation, gaming, and music video content in a player environment.'"); IAB UK, "A Guide to the Connected TV Supply Chain," IAB UK, March 2, 2021, https://www.iabuk.com/standard-content/guide-connected-tv-supply-chain ("The most prevalent format [of advertising on Connected TV] is instream video (pre-roll, mid-roll and post-roll)").

spaces and can be substituted in those spaces for "static" images.[18] Figure 8 below shows how instream video ad slots differ from display ad slots. In this report, I follow industry convention and distinguish between instream and outstream video ads, and use *display ads* to include outstream video but not instream video ads.

Figure 8. Example of digital instream video ad formats as specified by the Internet Advertising Bureau



Source: IAB, "Digital Video In-Stream Ad Format Guidelines,",IAB, January 2016, p. 7, https://www.iab.com/wp-content/uploads/2016/01/DVAFG_2015-01-08.pdf.

4. **Native**: Native ads are designed to blend in with the environment in which they are placed. While there are different types of native advertisements, the distinguishing feature of these ads is that

[18] The IAB defines the "Display (Banner / Rich Media)" advertising format as "a form of display advertising that can range from a static graphic to full motion video," and notes that "Video commercials that appear in video players are considered Digital Video Ads, not Rich Media." *See* Internet Advertising Bureau, "Internet Advertising Revenue Report: Full-year 2022 results," PwC & IAB Interactive Advertising Revenue Report, April 2023, https://www.iab.com/wp-content/uploads/2023/04/IAB_PwC_Internet_Advertising_Revenue_Report_2022.pdf. In Sections II and IV, I discuss differences between instream and outstream video ads further. *See also* IAB, "Digital Video In-Stream Ad Format Guidelines," IAB, January 8, 2016, https://www.iab.com/wp-content/uploads/2016/01/DVAFG_2015-01-08.pdf ("[A]ds in video format served to placements designated for display advertising are often confused with in-stream ads. Because video in-stream ads and in-display video are two ad forms that require different resources and technology, distinguishing the two are important to establishing digital video in-stream ad formats.").

they often mimic the style and structure of the surrounding content.[19] The following are prominent forms of native ads:

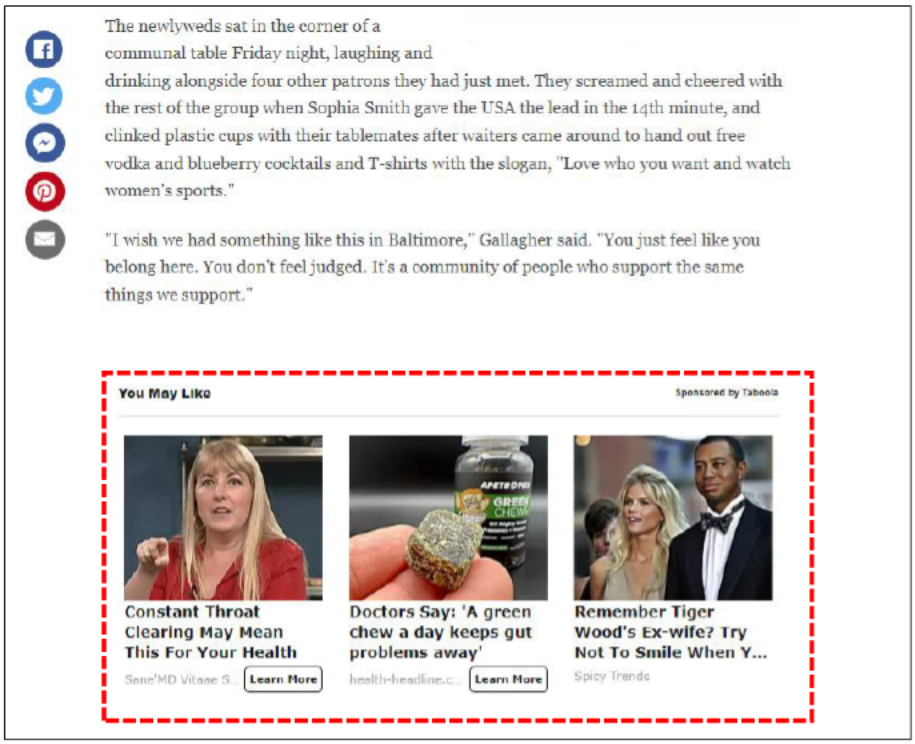
A. *Content recommendation* ads are collections of links that suggest additional external content for users. Advertisers may purchase these ad slots with the intention of driving traffic to the posted content.[20] [redacted] Figure 9 below shows an example of a content recommendation widget displayed on a webpage—in this case below a news article. Figure 10 shows how Google's Multiplex content recommendation product appears on a desktop computer.

[19] Although some sources may consider part of native advertising to be a part of display advertising, to be precise in my discussion, I do not use the term "display advertising" in this report to include native advertising unless explicitly stated otherwise. I discuss differences between display ads and native ads further in Section IV.B.1.a.ii.

[20] MMA Mobile Native Advertising Committee, "The Mobile Native Ad Formats," *Mobile Marketing Association*, accessed December 18, 2023, https://www.mmaglobal.com/files/documents/the_mobile_native_formats_final.pdf.

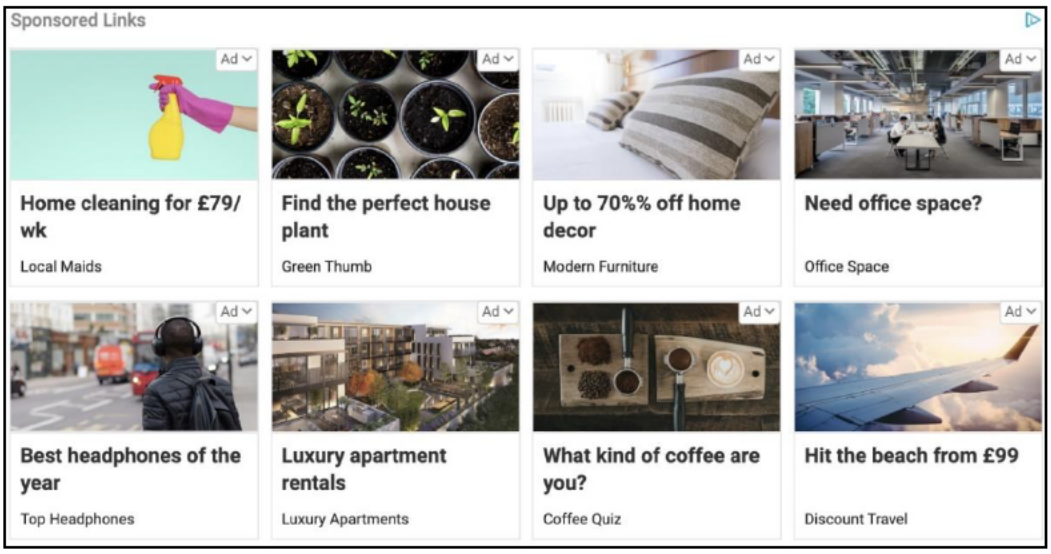
[21] [redacted] *See also* Section IV.B.1.a.ii.

Figure 9. Example of content recommendation displayed below site content



Source: Jamie Goldberg, "First US all-women's-sports bar embraces the Women's World Cup", ESPN, captured on August 30, 2023, https://www.espn.com/soccer/story/_/id/38049431/uswnt-world-cup-game-sports-bra-portland-oregon.
Note: Red dashed lines highlight native ads shown through content recommendation.

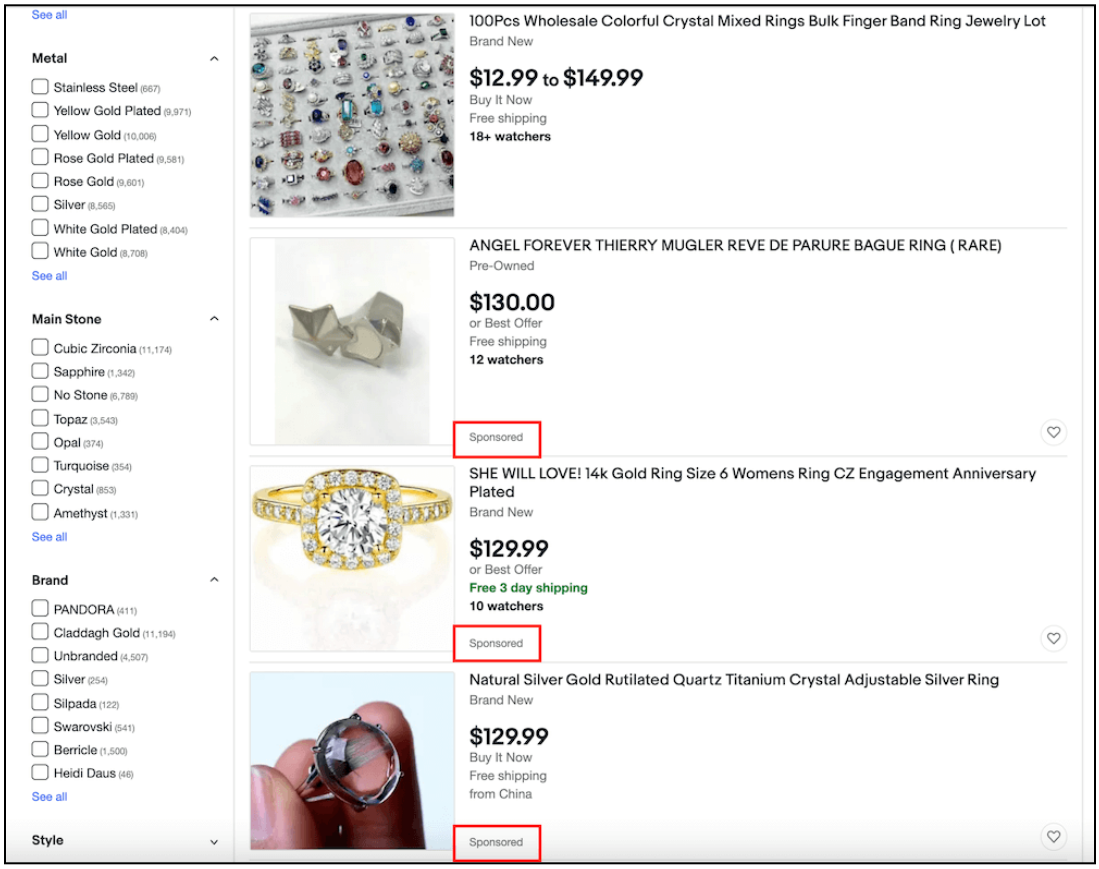
Figure 10. Example of Google's Multiplex content recommendation advertising on desktop



Source: Google,"About Multiplex ads," Google AdSense Help, accessed December 18, 2023, https://support.google.com/adsense/answer/9189566?hl=en.

B. *Sponsored Product* or *Sponsored Listing* [redacted] These may appear similar to organic product listings with prices, reviews, and product details appearing in paid ad slots.[23]

Figure 11. Example of sponsored listing ads alongside organic listings on Ebay



Source: Kevel, "Sponsored Listings: The Definitive Guide for 2023," Kevel, last modified March 2, 2019, https://www.kevel.com/blog/sponsored-listings.

C. Social media (or "in-feed social") ads appear in social media feeds and closely resemble organic posts on those sites.[24] Users of the social media site can often engage with (e.g.,

22 [redacted]

23 MMA Mobile Native Advertising Committee, "The Mobile Native Ad Formats," *Mobile Marketing Association*, accessed December 18, 2023, https://www.mmaglobal.com/files/documents/the_mobile_native_formats_final.pdf

24 Some in-feed ads can also be shown on non-social media sites. These ads are distinct from display ads because the ad slot blends in with the publisher's content (as opposed to occupying space on top of or around it) and the ad creative matches the aesthetic of the publisher's content. *See* Interactive Advertising Bureau, Interactive Advertising Bureau, "Native Advertising Playbook 2.0" Internet Advertising Bureau, May 2019, https://www.iab.com/wp-content/uploads/2019/05/IAB-Native-Advertising-Playbook-2_0_Final.pdf; MMA Mobile Native Advertising

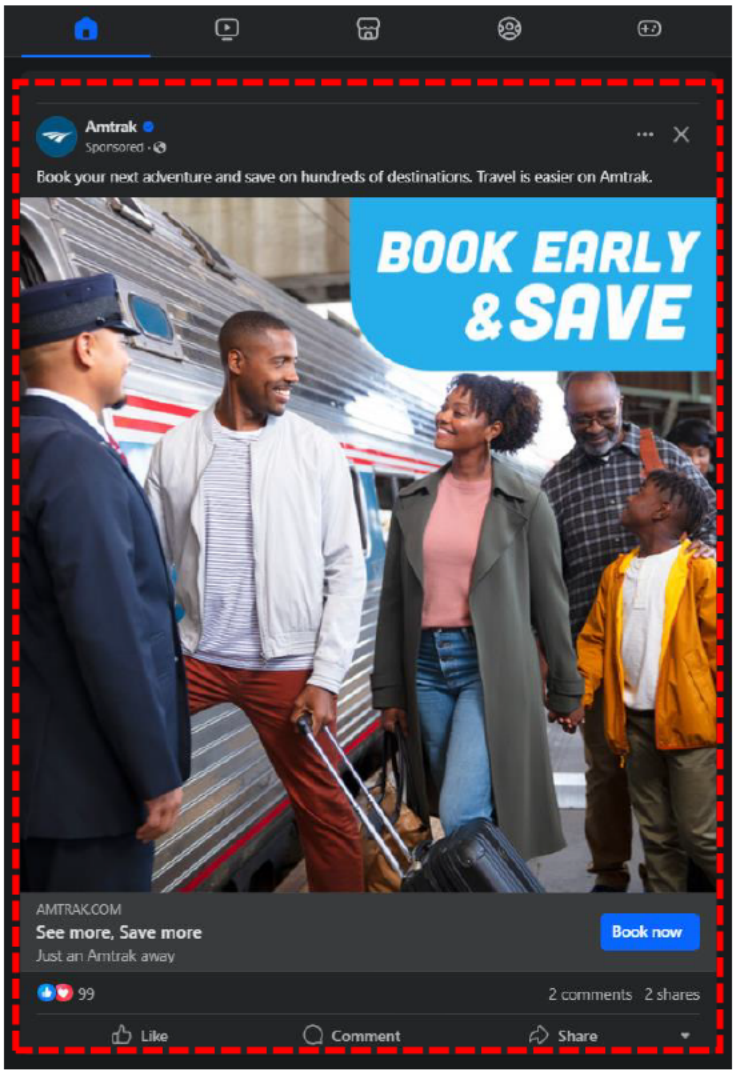
by reacting or commenting) the post. [redacted] Figure 12 below shows how an in-feed social media advertisement may appear on a social media site.

Committee, "The Mobile Native Ad Formats," MMA Mobile Native Advertising Committee, *Mobile Marketing Association*, accessed December 18, 2023, https://www.mmaglobal.com/files/documents/the_mobile_native_formats_final.pdf. In-feed ads can require substantial technical capability and be limited to more sophisticated publishers. [redacted]

25 MMA Mobile Native Advertising Committee, "The Mobile Native Ad Formats," Mobile Marketing Association, accessed December 18, 2023, https://www.mmaglobal.com/files/documents/the_mobile_native_formats_final.pdf, at 7–8. [redacted].

26 [redacted].

Figure 12. Example of in-feed social native ads shown on Facebook



Source: Facebook, captured November 9, 2023,www.facebook.com.
Note: Red dashed lines highlight in-feed social ads (known as "Facebook Feed"). *See* Meta, "About Meda ads placements", Meta Business Help Center, accessed December 18, 2023, https://www.facebook.com/business/help/407108559393196?id=369787570424415.

(50) Ad types can also be distinguished based on where digital advertising is shown. Web advertising refers to digital ads shown on websites, viewed on both desktop and mobile devices. In-app advertising refers to digital ads delivered within mobile applications, including those that are accessible on smartphones, tablets, or wearable devices.[27]

[27] *See* Interactive Advertising Bureau Europe, "IAB Europe's Guide to In-App Advertising," February 2022, https://iabeurope.eu/wp-content/uploads/2022/02/IAB-Europe-Guide-to-In-app-advertising.pptx.pdf, 6 ("In-App advertising refers to ads and ad campaigns that are delivered within mobile applications, including smartphones, tablets, or wearable devices").

II.A.1. Ad tech products for display advertising and their customers

(51) "Ad tech," short for advertising technology, refers to software and other tools used to purchase, sell, and manage digital display advertising. I refer to companies offering ad tech products as ad tech intermediaries.

(52) [redacted] Because advertisers are buyers and publishers are sellers of display ad inventory, advertisers are said to be on the "demand-side" (or "buy-side") while publishers are on the "supply-side" (or "sell-side").

(53) A variety of ad tech products work in conjunction with one another to facilitate display advertising transactions between publishers and advertisers. These products form what is known as the "ad tech stack." At a high level, the ad tech stack can be described as comprising three "layers" consisting of ad tech products that each serve different functions:

- publisher ad servers;
- ad exchanges; and
- advertiser bidding tools, comprising both demand-side platforms ("DSPs") and advertiser ad networks.[29]

(54) The purchase of a single online display ad "impression" (i.e., a single display ad shown to a single web visitor) by an advertiser from a publisher often involves participation by products in each of these layers. I describe these ad tech products in more detail in Section II.B.

(55) The focus of this report is ad tech products for display ads that are shown on websites, so unless otherwise specified, I will use the term *publishers* to refer to entities that operate online web pages and display content to web visitors. These publishers often monetize their web traffic by devoting some of the space on their web pages to display advertising. I will use the term *open-web publishers* to refer to those publishers that rely on third-party ad tech products (i.e., products that these publishers do not themselves own) to sell their display ad inventory.[30] [redacted]

[28] There are some forms of display ads that do not appear on websites, a notable example being in-app display ads. As I explain in Section IV, in-app ads are a distinct form of advertising from open-web display ads. Google also distinguishes between display, video, and in-app inventory. [redacted]

[29] Certain ad networks can also be used to connect advertisers and publishers without relying on exchanges or publisher ad servers. *See* Section II.B.2.b.

[30] Unless otherwise specified, I use "publishers" in this report to mean "open-web publishers," as these are the publisher customers of the ad tech products that are the focus of this report.

[redacted]

(56) In my report, I use "open-web display advertising" to refer to display ads shown on the websites (which can be viewed on desktop or mobile devices) of open-web publishers. This excludes other forms of digital advertising (including search and instream video), and display ads that are shown in applications used on mobile devices or on TV media players.[32] Similarly, unless otherwise specified, I use the term *advertisers* in this report to refer to entities that purchase display advertising inventory.

(57) Even though website visitors and hence viewers of display ads ("users" or "consumers") are not direct customers of ad tech products, they too can be affected by changes in the quality or cost of display advertising. For example, users may benefit if display ads become more "relevant," which can mean that ads more frequently contain valuable information for consumers. They may also benefit if increased monetization from display advertising allows publishers to fund the creation of new content. On the other hand, users can be made worse off if display advertisements become less relevant, rely on more personal data, become more expensive and lead to higher final prices of goods or services, or if publishers earn less from the sale of online display inventory and therefore are less able to produce valuable content.

II.A.2. Uses of different forms of digital advertising

(58) [redacted] These and other roles played by advertising are often described by marketers as corresponding to different stages of a consumer's "journey" toward making a purchase. Marketing

[31] [redacted]

[32] Apple and Android smartphones and tablets are examples of mobile devices, and Roku, AppleTV, Amazon's Fire TV, and Google's Chromecast are examples of TV media players.

[33] Philip Kotler and Kevin Lane Keller, *A Framework for Marketing Management*, 6th ed. (Pearson Education, 2016): 122. ("Some people are unaware of the product, some are aware, some are informed, some are interested, some desire the product, and some intend to buy… [M]arketers can employ a marketing funnel to break the market into buyer-readiness stages."). [redacted] *See also* Amazon Ads, "What is a marketing funnel? How they work, stages, and examples," Amazon Ads, accessed December 18, 2023, https://advertising.amazon.com/library/guides/marketing-funnel (describing a "four-stage marketing funnel" including the stages of "awareness, consideration, conversion, and loyalty.)

textbooks refer to these stages in the context of a *marketing funnel* "to break the market into buyer-readiness stages."[34]

(59) Different forms of advertising are perceived at targeting users who are at different stages of the marketing funnel. As described in a leading marketing textbook, when determining their online marketing strategy, "[a] company chooses which forms of online marketing will be most cost-effective in achieving communication and sales objectives. The options include Web sites, search ads, display ads, and e-mail."[35]

(60) [redacted] For example, Google describes the difference between search ads and display ads in their role in the marketing funnel as follows:

> While the Search Network can reach people when they're already searching for specific good or services, the Display Network can help you capture someone's attention earlier in the buying cycle. You can put your ads in front of people before they start searching for what you offer, which can be key for your overall advertising strategy.[37]

II.A.3. Audience targeting

(61) Compared to offline advertising, digital advertising offers advertisers a greater ability to engage in detailed "audience targeting." For example, while a print advertisement or traditional television commercial might be shown to all readers of a magazine or all viewers of a television program, a given website can show different display ads to different "targeted" users.

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[34] Philip Kotler and Kevin Lane Keller, *A Framework for Marketing Management*, 16th ed. (Pearson Education, 2016): 122 (A consumer's purchase journey need not be linear, as a consumer may revisit stages or proceed in a different ordering prior to making a purchase. The effectiveness of different forms of advertising will still vary depending on an advertiser's objective and the consumer's awareness, interest, and desire).

[35] Philip Kotler and Kevin Lane Keller, *A Framework for Marketing Management*, 16th ed. (Pearson Education, 2016): 275.

[36] [redacted]

[37] Google, "About Display ads and the Google Display Network," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/2404190. *See also* Figure 28 in Section IV.B.2.a.

Google emphasizes the benefits of using display and search advertising together, stating "a Search Network campaign with Display Expansion increases your reach" and can help advertisers gain "additional impressions and conversions," and "grow your potential audience." Google Ads Help, "About Display Expansion on Search campaigns," Google Ads Help, accessed December 19, 2023, https://support.google.com/google-ads/answer/7193800?hl=en&ref_topic=10543918&sjid=2955664926464503505-NA.

(62) To facilitate audience targeting with display ads, data are collected from various ad tech intermediaries and organized using "cookies" and other user identification techniques.[38] Using these data, advertiser- and publisher-facing technologies can build comprehensive user profiles that can assist advertisers with showing their ads only to users satisfying certain criteria. [redacted] An example of this targeting behavior occurs when a company may know that the consumer has visited its website previously, and the company purchases "retargeting" display ads that appear on other web sites that the consumer subsequently visits. More generally, while some display ads may be shown to everyone who visits a website, other ads may only be shown to selected consumers depending on their behavior, demographics (including location), or browsing context.

(63) I discuss companies' ability to use data to improve ad targeting in more detail in Section III.D.[40]

II.A.4. Types of display advertising transactions

(64) There are different ways in which publishers can sell their display ad inventory to advertisers. At the broadest level, display advertising transactions can be classified as *direct* or *indirect*. Figure 13 below presents a summary from an internal Google presentation that distinguishes between direct and indirect as well as between "programmatic" and traditional (or "non-programmatic") transactions.

[38] "Cookies" are pieces of text that are sent from websites that a user visits to their browser which allow websites to track information about the user, their behavior across websites, and can help to identify unique users across browsing sessions. These can be used to store user preferences and behavior on sites to be used for purposes like ad targeting. *See* Google, "Google Advertising Terms," Google Privacy and Terms, accessed December 18, 2023, https://policies.google.com/technologies/ads; Google, "Cookie and user identification," Google Security and Privacy, accessed December 18, 2023, https://developers.google.com/tag-platform/security/concepts/cookies.

[39] [redacted]

[40] This discussion also illustrates why, within display advertising, display ads shown on open-web publishers provide advertisers value by allowing them to track and target users across multiple websites. I discuss distinctions between advertising on open-web publishers and on those using integrated advertising tools in Section IV.B.2.b.

Figure 13. [redacted]

(65) **Direct transactions** refer to those that are subject to terms individually and "directly" negotiated between publishers and advertisers.[41] [redacted]

[41] Google, "Delivery basics: Ways of transacting in Ad Manager," Google Ad Managers Help, accessed on December 18, 2023, https://support.google.com/admanager/answer/9248464.

[42] [redacted] Google, "Get started with Programmatic Direct," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/6239618.

[43] *See* Interactive Advertising Bureau, "Glossary of Terminology," Interactive Advertising Bureau, accessed December 18, 2023, https://www.iab.com/insights/glossary-of-terminology/. [redacted]

[redacted]

(66) **Indirect transactions** allow open-web publishers to sell remaining ("remnant") ad space on a page not allocated to direct deals to advertisers using ad tech products. [redacted] or a wider set of potential advertisers (known as an "Open Auction").[46] Indirect [redacted]

(67) As I discuss further below in Section II.B.1, one of the primary features offered by a publisher ad server is its ability to assist a publisher managing the sale of display inventory using different transaction types.[48] Figure 14 below provides a depiction of how Google has categorized different transaction types for display advertising. I describe each of these in more detail below.

[44] Google, "Programmatic Guaranteed vs. Preferred Deals," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/7637485; Google, "Transaction types," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/7637485; Google, "Transaction types," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/2805834. *See also* [redacted]

[45] [redacted]

[46] Google, "Transaction types," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/2805834.

[47] Google, "Ways of transacting in Ad Manager," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/9248464. (Some documents reference traditional networks, which sell previously unsold remnant inventory at pre-defined prices, as "indirect"). [redacted]

[48] For example, when an online display impression becomes available for sale, a publisher's ad server decides how to prioritize different transaction methods. Programmatic Guaranteed deals typically share the highest priority with (non-programmatic) direct deals, and are tracked via Deal IDs, which uniquely identify an arrangement made between a publisher and an advertiser beforehand and allow the publisher to treat it according to the negotiated contract terms. *See, e.g.,* Google, "Line item types and priorities," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/177279; Google, "Programmatic Guaranteed vs. Preferred Deals," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/7637485. *See also* Interactive Advertising Bureau UK, "The Programmatic Handbook," Interactive Advertising Bureau UK, September 2014 https://www.iabuk.com/sites/default/files/The%20Programmatic%20Handbook.pdf, 35.

Figure 14. [redacted]

II.A.4.a. Direct transactions

(68) As stated above, in direct deals, inventory is transacted via terms arising from one-on-one negotiations between a publisher and an advertiser and can be facilitated either manually ("non-programmatically") or programmatically through ad tech products.

(69) In **non-programmatic direct** negotiations, the publisher and advertiser negotiate and agree on the terms of the deal, the advertisement is then sent to the publisher (e.g., via email), the publisher manually uploads the advertisement to its publisher ad server (the platform that hosts the publisher's ad inventory), and the publisher ad server serves the advertisement on the publisher's website.[49] Billing, payments, and reconciliation are handled manually by the publisher and advertiser.

(70) Whereas non-programmatic direct deals primarily involve manual negotiation and deal execution, programmatic direct automates many aspects of this process, allowing publishers to "negotiate direct-sold campaigns while taking advantage of programmatic technology."[50] With programmatic direct,

[49] Maciej Zawadziński, "Understanding RTB, Programmatic Direct and Private Marketplace," Clearcode, April 13, 2018, https://clearcode.cc/blog/rtb-programmatic-direct-pmp/. *See also* [redacted]

[50] Google, "Ways of transacting in Ad Manager," Google Ad Manager Help, accessed December 18, 2023,

publishers can choose to either directly negotiate with advertisers or offer fixed prices for inventory, and advertisers can either accept or not accept the price and terms set by the publisher.[51] Billing, payment, and reconciliation functions in programmatic direct are handled by ad tech intermediaries.[52]

(71) Within **programmatic direct** transactions are Programmatic Guaranteed and Preferred Deals:

- In **Programmatic Guaranteed** deals, one advertiser and one publisher agree on a fixed price for ad inventory that is then reserved (guaranteed) for the given buyer.[53] [redacted]
- For **Preferred Deals**, a publisher and an advertiser negotiate on the price for inventory that the advertiser can optionally buy. [redacted] If the advertiser chooses not to secure the inventory, it is then available to open auction and private auction bids. Publishers may prefer Preferred Deals over indirect transactions because the fixed price helps them "protect their yield," ensuring that certain ad slots are not sold for too low a price.[57] According to a Google document, Preferred Deals provide advertisers with an additional

https://support.google.com/admanager/answer/9248464.

51 Maciej Zawadziński, "Understanding RTB, Programmatic Direct and Private Marketplace," Clearcode, April 13, 2018, https://clearcode.cc/blog/rtb-programmatic-direct-pmp/.

52 Google, "Ways of transacting in Ad Manager," Google Ad Manager Help, accessed December 18, 2023, 2023, https://support.google.com/admanager/answer/9248464.

53 Google, "Programmatic Guaranteed vs. Preferred Deals," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/7637485; Interactive Advertising Bureau, "Standardizing programmatic terminology with the IAB," Interactive Advertising Bureau, April 23, 2014, https://www.iab.com/news/standardizing-programmatic-terminology-iab/ ("These are the most like traditional [non-programmatic] direct ad buys but are now handled automatically.").

54 Interactive Advertising Bureau, "Standardizing programmatic terminology with the IAB," Interactive Advertising Bureau, April 23, 2014, https://www.iab.com/news/standardizing-programmatic-terminology-iab/; [redacted].

55 Google, Programmatic Guaranteed vs. Preferred Deals," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/7637485; [redacted]

56 [redacted] According to Google Ad Manager's support website, when there are multiple Preferred Deals targeting the same inventory at the same price, Ad Manager chooses the winning buyer at random. Google, Programmatic Guaranteed vs. Preferred Deals," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/7637485.

57 Interactive Advertising Bureau UK, "The Programmatic Handbook," Interactive Advertising Bureau UK, September 2014, https://www.iabuk.com/sites/default/files/The%20Programmatic%20Handbook.pdf, 34.

flexibility to purchase ad inventory that meets their campaign goals without an "upfront commitment."[58]

(72) [redacted]

II.A.4.b. Indirect transactions and real-time bidding ("RTB")

(73) Indirect transactions fulfilled through auctions emerged in the late 2000s as an alternative way for publishers to fill remnant or otherwise unsold inventory, allowing a larger pool of buyers to bid on available ad space in "real-time."[61] Auctions involved participants engaging in *real-time bidding* ("RTB"), whereby ad inventory could be sold at variable prices whenever a user visited a webpage and impressions became available for sale.[62] [redacted]

58 DoubleClick by Google, "The buyer's guide to Programmatic Direct," Double Click by Google, accessed on December 18, 2023, https://www.thinkwithgoogle.com/_qs/documents/717/canadian-buyers-guide-to-programmatic-direct.pdf, 12 (describing an example where an advertiser targeting a certain demographic group identifies websites that complement its campaign, but, only a small fraction of these websites' visitors meets the targeting criteria).

59 [redacted]

60 [redacted]

61 Maciej Zawadzinski and Mike Sweeney, "Understanding RTB, Programmatic Direct and Private Marketplace," Clearcode, April 13, 2018, https://clearcode.cc/blog/rtb-programmatic-direct-pmp/. *See also* [redacted]

62 In my report, I use real-time bidding (RTB) to refer to the process by which a demand source is able to submit a bid for publishers' ad inventory at the impression (or "query") level and is not restricted to being able to purchase inventory at a predetermined price. For example, an open-web display transaction can involve RTB if real-time bids from various demand sources (e.g., from DSPs and advertiser ad networks within an ad exchange, or from ad exchanges within a publisher ad server) are sourced simultaneously. Although real-time bids can be sourced sequentially in a "waterfall" setup (see Section II.E.1), demand sources that are not called upon in a waterfall are not able to engage in RTB (and are instead, e.g., evaluated using a historical or static price). [redacted]

63 [redacted]

64 [redacted]

Figure 15. [redacted]

(74) [redacted]

(75) Industry participants recognize two types of auctions used to transact display ads, depending on whether the publisher places restrictions on the set of bidders. In **Private Auctions** (also referred to as

65 [redacted]

66 [redacted]

private marketplace), publishers use a private (invitation-only) auction open to specific buyer(s) and, as such, control which advertisers are able to bid on their ad inventory. This transaction format allows publishers to offer ad inventory to selected buyers, while still incorporating the benefits of RTB.[67] In **Open Auctions**, publishers allow a wider range of buyers to bid on their ad inventory.[68] Since the auction is open to a larger set of buyers, this format can increase yield and result in higher fill rates for remnant inventory. Bids from the Open Auction may compete with bids from the Private Auction either (1) concurrently if enabled by the publisher, or (2) subsequently if the available ad inventory is not filled in the Private Auction.[69]

II.A.4.c. Display advertising spending across transaction types

(76) Indirect transactions comprise a substantial proportion of total open-web display advertising transactions, both in terms of total spend as well as in impressions sold. Figure 16 shows trends in total spend on open-web display advertisements. Between 2018 and 2022, overall spend on indirect transactions grew by 10%. Over the same period, spend on direct transactions remained relatively steady.

[67] *See* AppsFlyer, "Real-time bidding (RTB)," AppsFlyer, accessed December 15, 2023, https://www.appsflyer.com/glossary/real-time-bidding/. Publishers usually select advertisers for Private Auctions using their publisher ad servers. For example, Google Ad Manager, Google's publisher ad server and exchange, allows publishers to select "verified advertisers" from a database of advertisers, and publishers can then allow only these advertisers to participate in a Private Auction. Google, "Google Ad Manager Help," Google Ad Manager, accessed December 16, 2023, https://support.google.com/admanager/answer/6084608.

[68] Google, "Transaction Types," Google Ad Manager, accessed December 16, 2023, https://support.google.com/admanager/answer/2805834.

[69] Google, "Auction Model," Google Ad Manager, accessed December 16, 2023, https://support.google.com/admanager/answer/152039;Google, "Private Auctions," Google Ad Manager, accessed December 16, 2023, https://support.google.com/admanager/answer/10863708.

Figure 16. [redacted]

(77) There has also been growth in the use of programmatic methods to transact display advertising. Online display advertising transactions have shifted significantly from non-programmatic to programmatic methods in recent years. Market research firm eMarketer estimates that the share of US digital display ad spending on programmatic ads (both direct and indirect) has grown from 14% in 2012 to 89% in 2021.[70]

(78) [redacted]

[70] US programmatic digital display ad spending data (eMarketer).

[71] [redacted]

Figure 17. [redacted]

II.B. Ad tech products used for web display advertising

(79) Multiple ad tech products, or "components," are used by publishers and advertisers to serve, manage, and transact display advertising.

(80) [redacted]

[redacted]

(84) In this subsection I describe the functionality of the highlighted ad tech components in Figure 19 (publisher ad servers, DSPs, advertiser ad networks, and ad exchanges). I provide more detail about Google's specific offerings in Section II.C.[75]

II.B.1. Publisher ad servers

(85) Publisher ad servers are software products, often centrally hosted and accessed over the internet, used by publishers to facilitate the management and sale of display ads across different demand sources (e.g., ad networks and ad exchanges) and transaction types (e.g., direct and indirect deals).[76] While in

[75] [redacted]
Advertiser ad servers are software products used by advertisers to serve, manage, and track their ad campaigns across websites and applications. They help share the chosen creative with publishers and monitor user clicks, conversions, and other relevant metrics across publishing platforms. IAB, Glossary of Terminology," IAB, accessed December 16, 2023, https://www.iab.com/insights/glossary-of-terminology/; Ankit Oberoi, "What is an ad server and how does it work?" https://www.adpushup.com/blog/the-ultimate-guide-to-ad-servers/. Companies such as Adform, Google and Sizmek operate advertiser ad servers. *See* Adform, "The Adform Ad Server," Adform, accessed December 18, 2023, https://site.adform.com/products/integrated-advertising-platform/ad-serving/; Google, "Overview of Campaign Manager 360," Campaign Manager 360 Help, accessed December 18, 2023, https://support.google.com/campaignmanager/answer/2709362; Delacon, "Sizmek MDX," Delacon, accessed December 18, 2023, https://www.delaconcorp.com/integrations/third-party-ad-server/sizmek-mdx/.
DMPs are software products that collect, store, and organize advertising-related data for advertisers, publishers, and other intermediaries for the purposes to improving ad targeting and conducting advanced analytics. *See* Maciej Zawadziński and Mike Sweeney, "What is a Data Management Platform (DMP) and How Does it Work?" Clearcode, May 21, 2015, https://clearcode.cc/blog/data-management-platforms/. DMPs combine data from their customers (publishers or advertisers, usually via their ad servers), with data from other significant players in the advertising industry, and broad data aggregators. *See* Lotame, "First-Party Data, Second-Party Data, Third-Party Data: What Does It All Mean?" Lotame, last modified November 16, 2023, https://www.lotame.com/1st-party-2nd-party-3rd-party-data-what-does-it-all-mean/. Other than Google, companies such as Adobe, Lotame, Nielsen, and Oracle operate DMPs. Adobe Experience Cloud, "Building an experience business starts with an experience-based DMP," Adobe Experience Cloud, accessed December 21, 2023, https://www.adobe.com/experience-cloud/topics/data-management-platform-dmp.html; Lotame, "What is a Data Management Platform (DMP)?" Lotame, last modified November 14, 2023, https://www.lotame.com/what-is-a-data-management-platform/; Nielsen, "Modernize for the future for smarter and more effective marketing," Nielsen, accessed December 21, 2023, https://www.nielsen.com/solutions/media-planning/marketing-cloud/; Oracle, "Oracle BlueKai Data Management Platform," Oracle, accessed December 21, 2023, https://www.oracle.com/cx/marketing/data-management-platform.
Other products used by advertisers include creative suites, which help advertisers build advertisements, and media planners, which help advertisers plan their advertising campaigns.

[76] Industry participants have referred to publisher ad servers as a "software-as-a-service" (SaaS) product, i.e., a product in which software is centrally hosted and licensed to users to access online. Alise Zaiceva, "What is an Ad Server? A Complete Guide for Publishers," SETUPAD Blog, January 9, 2023, https://setupad.com/blog/ad-server/. [redacted]

principle a publisher could sell ad inventory to a narrower set of buyers without a separate ad server, a publisher ad server allows a publisher to manage a wider range of demand sources and transaction types, as I discuss in Section IV.C.1.

(86) [redacted]

(87) Below, in Section II.C.1, I provide more details about how publisher ad servers work.

(88) [redacted]

77 [redacted]

81 *See* Section III.C. [redacted]

82 *See* Section III.C. [redacted]

[redacted]

(95) As I discuss in Section III.C, there is evidence that advertisers using DSPs often use more than one.

(96) *DV360*, formerly DoubleClick Bid Manager ("DBM"), is Google's DSP. Other companies that offer or have offered DSP products are Adobe,[97] Amazon,[98] The Trade Desk,[99] Verizon Media,[100] and Xandr.[101]

II.B.2.b. Advertiser ad networks

(97) Similar to DSPs, advertiser ad networks are products that advertisers use to purchase display ad inventory from publishers.[102,103] [redacted]

[95] [redacted] *See also* Deepak Sharma, "DSP vs. DMP: Differences, Similarities, and Their Hybrid Model," adpushup, March 3, 2023, https://www.adpushup.com/blog/dsp-vs-dmp-differences-similarities-and-their-hybrid-model/.

[96] Display and Video 360 Help, "Managing Exchanges," Google DV360, accessed December 16, 2023, https://support.google.com/displayvideo/answer/9230278. *See also* [redacted]

[97] Adobe Experience Cloud, "One demand-side platform to rule them all," Adobe Experience Cloud, accessed December 14, 2023, https://www.adobe.com/advertising/demand-side-platform.

[98] Amazon Ads, "Amazon DSP," Amazon Ads, accessed December 16, 2023, https://advertising.amazon.com/solutions/products/amazon-dsp.

[99] The Trade Desk, "The Trade Desk repeats as top-ranked demand side platform based on Net Promoter Score," Tthe Trade Desk, October 31, 2017, https://www.thetradedesk.com/press-releases/the-trade-desk-repeats-as-top-ranked-demand-side-platform-based-on-net-promoter-score.

[100] Yahoo Advertising, "Ad Solutions Worth Yodeling About," Yahoo Advertising, accessed December 16, 2023, https://www.verizonmedia.com/insights/emerging-channels-reach-audiences-in-new-ways-with-our-dsp.

[101] Microsoft Advertising, "Xandr," Microsoft Advertising, accessed December 16, 2023, https://www.xandr.com/platform/invest/.

[102] Maciej Zawadzinski and Mike Sweeney, "What is an Ad Network and How Does it Work?," Clearcode, March 7, 2018, https://clearcode.cc/blog/what-is-an-ad-network-and-how-does-it-work/. *See also* [redacted]

[103] Ad networks, [redacted] can have both an advertiser-facing component ("advertiser ad network") and a publisher-facing component. As noted above, Google Ads is the advertiser-facing component of Google's GDN network; AdSense is the publisher-facing component. I describe AdSense in further detail in Section II.C.3.b below.

[104] [redacted]

(98) Advertiser ad networks historically collected unsold inventory from multiple publishers and re-sold it to advertisers in bulk at prices lower than those achieved through direct deals.[105] Following the rise in popularity of ad exchanges, advertiser ad networks evolved their business model to include providing advertiser access to impressions from ad exchanges via Real Time Bidding ("RTB").[106] Advertiser ad networks in their current form have different ways of facilitating the sale of remnant inventory. Some ad networks—including Google's Display Network, comprising Google Ads and AdSense, for example—purchase inventory for advertisers indirectly either through RTB on an exchange or through its publisher-facing ad network component.

(99) [redacted] (See Section IV.E for further discussion on differences between CPM and CPC bidding.)

(100) [redacted] but may provide other features including audience targeting, creative generation, and campaign optimization.[110] [redacted]

[105] Maciej Zawadzinski and Mike Sweeney, "What is an Ad Network and How Does it Work?," Clearcode, March 7, 2018, https://clearcode.cc/blog/what-is-an-ad-network-and-how-does-it-work/.

[106] Jack Marshall, "WTF is an ad exchange," Digiday, January 3, 2014, https://digiday.com/media/what-is-an-ad-exchange/.

[107] Google's ad networks (Google Ads, AdSense, and AdMob) and Criteo all use a CPC model for at least some of their transactions. *See also* Section IV.E. *See also* "Cost-per-click (CPC)," *available at* https://support.google.com/admob/answer/3026445?hl=en.

[108] [redacted]

[109] [redacted]

[110] IAB, "Glossary of Terminology," IAB, accessed December 16, 2023, https://www.iab.com/insights/glossary-of-terminology/.

[111] [redacted]

(101) [redacted]

(102) Ad networks, like Google's Display Network with *AdSense*, may also have a publisher-facing component used by open-web publishers to sell display inventory. I describe AdSense in further detail in Section II.C.3.b below.

II.B.3. Ad exchanges

(103) Ad exchanges (also previously referred to as supply side platforms, or "SSPs") are software products that run real-time auctions for publishers' display ad inventory.[114, 115] Publishers can sell display ads through ad exchanges via a publisher ad server, and advertisers can bid on those impressions using DSPs and advertiser ad networks.

(104) [redacted]

[112] A 2018 Google document describes Criteo as a "[c]ompetitive performance ad network" and lists Facebook Ads (no longer active in open-web display) as the only other display ad network competitor. *See* [redacted] *See* Section V.D.

[113] Allison Schiff, "Facebook is Killing Off Its Web Supply In Audience Network – And Don't Be Surprised If It All Shuts Down," adexchanger, February 5, 2020, https://www.adexchanger.com/platforms/facebook-is-killing-off-its-web-supply-in-audience-network-and-dont-be-surprised-if-it-all-shuts-down/. *See also* Meta, "Changes to Web and In-stream Placements," https://www.facebook.com/business/help/645132129564436; Meta, "Meta Audience Network," https://www.facebook.com/audiencenetwork/ and discussion in Section V.B.2.b.

[114] While previously distinct, SSPs and ad exchanges today are often used to refer to the same set of products. GOOG-DOJ-04429792 ("Monetization Cheatsheet" presentation) at -795 (03/27/2017) ("Sell Side Platform (SSP)/Exchange – service for managing multiple programmatic monetization sources of online display inventory, DSP and ad networks are considered 'Buyers', and publishers and publisher networks are considered 'Sellers'. Google Exchange is called AdX"). [redacted] Often SSP and Exchange are bundled as one product and both names are used interchangeably"); Ryan Joe, "Defining SSPs, Ad Exchanges and Rubicon Project," AdExchanger, Feb. 7, 2014, https://www.adexchanger.com/yield-management-tools/defining-ssps-ad-exchanges-and-rubicon-project/ ("The distinction between an ad exchange and a supply-side platform (SSP) has become muddled as the once disparate but complementary technologies have merged."). *See also* Michal Wlosik and Maciej Zawadzinski, "What is a Supply-Side Platform (SSP) and How Does It Work?," Clearcode, October 18, 2018, https://clearcode.cc/blog/what-is-supply-side-platform/.

[115] While certain exchanges such as Google's AdX have begun to facilitate programmatic direct transactions, ad exchanges have primarily fulfilled indirect deals via RTB auctions. In 2022, fewer than 4% of impressions and less than 14% of spend transacted by exchanges that produced data sufficient to identify transaction type in this matter were transacted through direct transactions.

[116] [redacted]

(107) [redacted]

II.C. Google's ad tech products

(108) In this Section, I describe Google's publisher ad server, ad exchange, ad network, and DSP products.

- In Section II.C.1, I describe DFP, Google's publisher ad server.
- [redacted]
- In Section II.C.3, I describe Google Ads and AdSense, which are the advertiser- and publisher-facing components of the Google Display Network.
- In Section II.C.4, I describe DV360, Google's DSP.

(109) Last, in Section II.C.5, I briefly describe other products that Google owns that facilitates the sale of digital display advertising, including its advertiser ad server, Google Campaign Manager, and its data analytics product, Google Analytics.[125]

II.C.1. DoubleClick for Publishers (DFP)

(110) [redacted]

[123] [redacted]

[124] In June 2018, Google introduced Google Ad Manager (GAM) which combined DFP and AdX. Jonathan Bellack, "Introducing Google Ad Manager," Google Ad Manager, Jun. 26, 2018, https://blog.google/products/admanager/introducing-google-ad-manager/. *See* Appendix K.1 for further detail on GAM. There is still a distinction between AdX and DFP. *See e.g.*, [redacted]

[125] I also describe its AdMob product which focuses on in-app advertising,

[126] Historically there have been two versions of DFP (DFP Premium and DFP Small Business) that differed in pricing and features. Currently, GAM 360 and GAM include these products. *See, e.g.*, [redacted] *See also* Google, "Repost: Publishers are succeeding on DFP," DoubleClick Publisher Blog, October 29, 2012, https://doubleclick-publishers.googleblog.com/2012/10/ ("We announced DFP two years ago with the goal of helping publishers open doors to new revenue. Since then, thousands of our smaller publishers have switched to DFP for Small Business and hundreds of our largest partners to DFP Premium."). *See also* [redacted]; *See* Section II.D for a description of DFP pricing.

(111) DFP's transaction methods include, for example, Programmatic Guaranteed, Preferred Deals, Open and Private Auction, and non-programmatic direct deals in which the terms are negotiated and finalized outside of DFP.[127]

(112) Publishers can either sell individual ad units or create "placements," which are groupings of similar ad units that publishers bundle together to sell in bulk.[128]

(113) Each ad unit has an associated "tag," which is a line of code that the publisher inserts on one of its webpages. The tag allows a user's web browser to communicate with the publisher's ad server whenever the user visits the publisher's webpage and a display ad impression becomes available.[129] Whenever a user loads a webpage with a tag, the tag sends information to DFP, including,[130]

- The HTTP header, which contains information on the user's browser type, operating system, date and time;
- The user's IP address, which contains the user's geographic location;
- A user identifier, which provides additional information about the user, for example through DoubleClick cookies or a mobile device identifier;
- Custom targeting criteria set by the publisher, such as size and other characteristics of the ad unit, and information about what types of advertisements can appear;

(114) An important role of DFP (and publisher ad servers in general) is deciding which advertisements are displayed on the publisher's webpage. Using the data provided by the tag, DFP references a list of "line items" representing potential advertising sources available to the publisher that the publisher has placed into DFP, and selects those line items that match the targeting criteria set by the publisher which are then "eligible" to be served. Line items contain information about how certain advertisements are intended to serve on the publisher's website or app, and can represent both guaranteed and non-guaranteed deals.[131]

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[127] Google, "Ways of Transacting in Ad Manager," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/9248464?hl=en&ref_topic=7506292.

[128] Google, "About Placements," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/177397?hl=en.

[129] Google, "Overview of Google Publisher Tag," Google Ad Manager Help, accessed https://support.google.com/admanager/answer/181073?hl=en&ref_topic=4390039&visit_id=637345059942282309-4157743706&rd=1.

[130] Google, "Overview of Google Publisher Tag," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/1143651?hl=en&ref_topic=7506292.

[131] Google, "About line items," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/9405477?hl=en&ref_topic=7506394. *See also* Google Ad Manager Help, "Ad selection white paper," Google Ads Manager Help, https://support.google.com/admanager/answer/1143651?hl=en&ref_topic=7506292.

(115) For example, if a publisher negotiates a direct deal with an advertiser, the publisher entering that deal into DFP would create line items reflecting the number of times the advertisement(s) are meant to be served, the cost negotiated for the campaign, the start and end times of the campaign, and any targeting criteria set by the advertiser.[132] DFP then uses a priority system in its determination of which ad to serve, where priority levels range from 1 (highest priority) to 16 (lowest priority) based on the line item's characteristics.[133]

(116) Figure 20 and Figure 21 depict and describe various line item types and their priorities within DFP. An important distinction is whether line items are *guaranteed* or *non-guaranteed.*

(117) **Guaranteed line items.** [redacted]

(118) **Non-guaranteed line items.** For non-guaranteed line items, publishers select either *network, bulk,* or *price priority* based on their delivery goals as described in Figure 20.[137] A publisher can also rely on "house" ads, generally used by the publisher to advertise its own products and services, as the lowest priority line item to display if no higher priority ad is served.

[132] Google, "About line items," Google Ads Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/9405477?hl=en&ref_topic=7506394.

[133] Google, "Line item types and priorities," Google Ads Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/177279.

[134] GOOG-DOJ-09498307, at -312 (12/10/2019).

[135] GOOG-DOJ-12799286, at -291 (12/09/2019). The presentation also states that standard line items are "used by a publisher for booking directly sold campaigns and often includes additional first party data targeting or a custom integration that is not available through RTB", and price priority "is used for non-guaranteed line items such as exchange partners, SSPs, or networks" which "require publishers to enter a booked CPM rate."

[136] GOOG-DOJ-09498307, at -312 (12/10/2019); GOOG-DOJ-12799286, at -291 (12/09/2019).

[137] Google, "Line item types and priorities," Google Ads Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/177279 ("Any third-party ad network or exchange that provides an appropriate ad tag can be represented by a non-guaranteed line item that competes based on a price that you enter into Ad Manager–for example, this is how header bidding can be configured.").

Figure 20. [redacted]

Figure 21. Line item types and priorities in DFP

Line item category	Line item type	Priority	Description
Guaranteed	Sponsorship	4	Serve based upon a defined percentage of impressions and a start and end time. Use this line item type for directly sold campaigns when your buyer wants to "takeover" a page or site. Can also be used to evenly rotate line items regardless of impression volume.
	Standard	6, 8, 10	Serve based upon a defined impression goal and start and end time. Use this line item type for directly sold campaigns when your buyer wants a specific number of impressions to serve. Delivery pacing is adjusted to meet the defined goal.
Ad network and exchange Non-guaranteed	AdSense	12	Target line items to specific inventory available to AdSense buyers via a line item. The AdSense line item type must be enabled for your Ad Manager network to use this option. If you don't see this line item type when adding a line item, talk to your Ad Manager administrator. Google Ad Manager also allows you to activate ad units for AdSense competition. One or more AdSense accounts may be used for various segments of inventory.
	Ad Exchange	12	Target line items to specific inventory available to Authorized Buyers and the Open Auction. One or more Exchange accounts may be used for various segments of inventory.
Other non-guaranteed	Network	12	Serve based upon a defined percentage of impressions. Use this for your partner ad networks which don't have an impression goal.
	Bulk	12	Serve based upon a defined impression goal, but because the inventory for bulk line items isn't guaranteed, the impression goal functions more like an impression cap, limiting the number of impressions that can be delivered. Use this for partners who have ordered a maximum number of impressions but aren't concerned about delivery timelines or guarantees.
	Price priority	12	Serve primarily based on price, with optional daily or lifetime delivery caps. Use this line item type to fill your site's unsold inventory with the highest-paying line item available.
	House	16	House line items only serve when no remnant line items (Network, Bulk, Price Priority), Ad Exchange or Open Bidding demand are available to serve. That is, House line items are treated as if they have a $0 rate and do not compete on price via Dynamic Allocation. House line item CPM determines ranking of eligible House ads but do not need to meet any floor price set in unified pricing rules in order to be eligible to serve an ad, thereby effectively serving as a fall-back ad.

Source: Google, "Line items types and priorities," Google Ad Manager Help, accessed December 18, 2023, https://support.google.com/admanager/answer/177279.
Note: Lower priority numbers indicate a higher priority.

(119) [redacted]

138 [redacted]

139 [redacted]

II.C.3. Google Display Network (GDN)

(122) Google's display ad network, also referred to as the Google Display Network (GDN), consists of over 2 million websites, videos, and apps where targeted display ads can appear.[143] GDN consists of an advertiser-facing component, known as Google Ads, and a publisher-facing component, known as AdSense.

II.C.3.a. Google Ads

(123) Google Ads is Google's advertiser ad network.[144] [redacted] Using Google Ads, advertisers can control their ad settings and choose specific formats that they wish to run (e.g., text or image).[146] As they run ads, advertisers can also track campaign data related to conversions,[147] click-through rate ("CTR"),[148] keywords, search terms,[149] impressions, clicks, and average CPC.[150]

(124) One important feature of Google Ads as an advertiser ad network is the ability for bidders to bid for display ads on a CPC basis, even for impressions that are sold on a CPM basis. See Section II.B.2.b and Section IV.E.

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[143] Google, "Display Network: Definition," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/117120. Note that "GDN" is used in internal documents and depositions to refer to both Google Ads and Google's sell-side inventory (e.g., AdSense publishers).

[144] Google, "Google Ads," accessed December 18, 2023, https://ads.google.com/home/. Originally launched in 2000 as Google AdWords, Google Ads originally allowed businesses to buy advertisements on Google search engine results pages. *See* [redacted] Today, Google Ads allows businesses to execute Search, Shopping, Display, Video, App, and Local Campaigns, thus reaching audiences through Search, across websites, within Gmail, on YouTube, and more. *See* Dennis Buckley, "Types of Google Ads: Ad Formats, Campaign Types & Best Practices for 2022," Demand Curve, accessed December 18, 2023, https://www.demandcurve.com/blog/types-of-google-ads; Google, "Chose the right campaign type," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/2567043. In this report, when I use Google Ads, I am referring to its display advertising component.

[145] [redacted]

[146] Google, "About Ad Formats available in different campaign types," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/1722124?hl=en&ref_topic=3121941.

[147] Google, "About return on investment (ROI)," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/1722066?hl=en&ref_topic=3121936.

[148] "CTR is the number of clicks that your ad receives divided by the number of times your ad is shown." Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/search?q=ctr.

[149] Google, "Measure traffic to your website," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/1722035?hl=en&ref_topic=3121936.

[150] Google, "Use data to optimize your search campaigns," Google Ads Help, accessed December 18, 2023, https://support.google.com/google-ads/answer/9451527?hl=en&ref_topic=3121936.

(125) Google Ads, with some limited exceptions (see Section VII.B.3), restricts its purchase of publisher display inventory to AdX and the publisher-facing component of its ad network, AdSense (which I describe next). [redacted]

Figure 23. [redacted]

[redacted]

II.C.3.b. AdSense

(126) AdSense is the web publisher-facing component of Google's display ad network,[151] [redacted]

[151] Google, "Compare Ad Manager, AdSense, and AdMob," Google AdSense Help, accessed December 18, 2023, https://support.google.com/adsense/answer/9234653?hl=en&ref_topic=1319753. [redacted]. AFS allows publishers to monetize search results by serving ads within the publisher's own search features. When I refer to AdSense, I focus on AdSense for content as the relevant display product for this report. *See* Google, "Adsense for Search (AFS)," Google AdSense Help, accessed December 18, 2023, https://support.google.com/adsense/answer/9879?hl=en.

[152] [redacted].

II.D. Fees for ad tech products

(138) [redacted]

(139) [redacted]

[178] [redacted]

[179] [redacted]

[redacted]

(140) [redacted]

[redacted]

182 [redacted]

183 [redacted]

[redacted] Google, "AdSense revenue share," Google AdSense Help, accessed December 18, 2023, https://support.google.com/adsense/answer/180195.

(141) [redacted] Some DSPs may also incorporate a tiering system whereby the aggregate per-transaction fee shifts based on the total volume of transactions an advertiser purchases.[190]

(142) [redacted]

(143) [redacted]

189 [redacted]

190 "DSPs offering [a share of media cost-based pricing model] will usually do so on a sliding scale or tiered system based on volume; for example, you might pay 15% of all media purchased before hitting $250k and 14% for spend between $250k and $500k". *See* IPONWEB, "The Price is Right: Which Programmatic Pricing Model Should You Choose?," IPONWEB, June 30, 2021, https://www.iponweb.com/the-price-is-right-which-programmatic-pricing-model-should-you-choose/.

191 [redacted] Google publicly acknowledged that its take from advertiser spend flowing through Google Ads/DV360 and GAM in 2019 was approximately 31%. *See See* Sissie Hsiao, "How our display buying platforms share revenue with publishers," Google Ad Manager, June 23, 2020, https://blog.google/products/admanager/display-buying-share-revenue-publishers/.

192 [redacted]

[redacted] Some responses involved introducing new products and features (e.g., Google's Exchange Bidding product), consistent with competitive pressures benefiting customers. Other responses—including those that removed product features, eliminated rivals, or otherwise impeded their ability to attract advertisers and publishers—likely harmed customers and competition.

III.D. The importance of scale for the competitiveness of ad tech products

(194) The competitiveness of a product is affected by both its attractiveness to customers and its costs of production. Within economics, it is well known that a product's *scale* across a variety of measures can affect both of these dimensions of competitiveness. For example,

- If a product is more attractive to each user as the total number of users grows, a product exhibits positive network effects.[257]
- If the average cost of producing a product falls as more of the product is supplied, there are economies of scale.[258]
- If doubling the inputs used to make a product more than doubles the amount of output, there are increasing returns to scale.[259]

(195) These concepts—network effects, economies of scale, and returns to scale—are widely referenced and have been extensively studied empirically in the academic literature across a diverse range of industries.[260]

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256 [redacted]

257 *See* Dennis W. Carlton and Jeffrey M. Perloff, *Modern Industrial Organization* (Boston: Pearson/Addison Wesley, 2005), 392–93; Robert S. Pindyck and Daniel L. Rubinfeld, *Microeconomics*, 7th ed. (Upper Saddle River: Pearson Prentice Hall, 2009), 136–140 and 515–516 (explaining why Internet auctions are subject to very strong positive network effects); Hal R. Varian, *Intermediate Microeconomics*, 9th ed. (New York: W.W. Norton & Company, 2014), 697–699.

258 *See* B. Douglas Bernheim and Michael D. Whinston, *Microeconomics*, 2nd ed. (New York: McGraw-Hill Education, 2014), 271–273; Robert S. Pindyck and Daniel L. Rubinfeld, *Microeconomics*, 7th ed. (Upper Saddle River: Pearson Prentice Hall, 2009), 245–247; Hal R. Varian, *Intermediate Microeconomics*, 9th ed. (New York: W.W. Norton & Company, 2014), 387–388.

259 *See* B. Douglas Bernheim and Michael D. Whinston, *Microeconomics*, 2nd ed. (New York: McGraw-Hill Education, 2014), 228–231; Robert S. Pindyck and Daniel L. Rubinfeld, *Microeconomics*, 7th ed. (Upper Saddle River: Pearson Prentice Hall, 2009), 215–218; Hal R. Varian, *Intermediate Microeconomics*, 9th ed. (New York: W.W. Norton & Company, 2014), 358–361.

260 *See, e.g.*, Susanto Basu and John G. Fernald, "Returns to Scale in U.S. Production: Estimates and Implications," *Journal of Political Economy* 105, no. 2 (1997), 249–283; Jan De Loekcer and Chad Syverson, "An industrial organization perspective on productivity," *Handbook of Industrial Organization*, Volume 4, eds. Kate Ho, Ali Hortaçsu, and Alessandro Lizzeri (2021), 141–223; Dimitrije Ruzic and Sui-Jade Ho, "Returns to Scale, Productivity, Measurement,

(196) As used in this report for the purposes of discussing ad tech products, I use *scale* to refer to two measures. The first is related to the *adoption* of an ad tech product by customers, as measured by the number of advertisers and publishers using a product. The second is related to the *usage* of an ad tech product, as measured by the volume of impressions that a network, exchange, or server "sees" (i.e., is able to bid upon or solicit bids for) or "wins" and is ultimately served by that product.

(197) In this Section, I describe why these measures of scale, measured by both adoption and usage, is important for the competitiveness of ad tech products that are the focus of this report in at least three ways:

1. Due to positive indirect network effects, greater adoption by publishers and advertisers improves the attractiveness of an ad tech product to each set of customers (Section III.D.1).

1. When there are significant fixed costs for an ad tech product, greater usage improves that product's scale economies—i.e., the extent to which fixed costs can be covered by margins earned across more impressions and sales (Section III.D.2).

2. Greater usage generates data, which is used to improve a product's attractiveness to advertisers and/or publishers (for example, by improving ad targeting or pricing algorithms) or its profitability for its owner, and facilitates experimentation which assists with innovation and product improvement (Section III.D.3).

(198) An ad tech product that is meaningfully impeded from acquiring scale would thus likely be at a significant competitive disadvantage relative to one that does not face such constraints. This is because products that are denied scale would be less able to offer comparably attractive or low-priced products, and improve their product offerings through investment and experimentation.

(199) Although this discussion highlights the value of scale for improving an ad tech product's competitiveness, it is also important to bear in mind that scale wielded by a firm with substantial market power can be used for anticompetitive ends. Later in this report, I address how Google's scale is a source of its market power (Section V.A), and how Google used its market power to harm the

and Trends in US Manufacturing Misallocation," *Review of Economics and Statistics* 105, no. 5 (2023), 1287–1303; Joe S. Bain, "Economies of Scale, Concentration, and the Condition of Entry in Twenty Manufacturing Industries," *American Economic Review* 44, no. 1 (1954), 15–39; Hassan Y. Aly, Richard Grabowski, Carl Pasurka and Nanda Rangan, "Technical, Scale, and Allocative Efficiencies in US Banking: An Empirical Investigation," *Review of Economics and Statistics* 72, no. 2 (1990), 211–218; Christopher C. Klein and Reuben Kyle, "Technological Change and the Production of Ocean Shipping Services," *Review of Industrial Organization* 12, no. 5/6 (1997), 733–750; Neil Gandal, "Hedonic Price Indexes for Spreadsheets and An Empirical Test for Network Externalities," *RAND Journal of Economics* 25, no. 1 (1994), 160–170 ; Garth Saloner and Andrea Shepard, "Adoption of Technologies with Network Effects: An Empirical Examination of the Adoption of Teller Machines," *RAND Journal of Economics* 26, no. 3 (1995), 479–501; Bruno Jullien, Alessandro Pavan, and Marc Rysman, "Two-sided Markets, Pricing, and Network Effects," *Handbook of Industrial Organization*, Volume 4, eds. Kate Ho, Ali Hortaçsu, and Alessandro Lizzeri (2021), 485–592.

competitiveness of rivals—in part, by denying them scale that would have enabled them to improve the attractiveness of their products (Section VII.F).

III.D.1. Greater advertiser and publisher usage generates positive indirect network effects

(200) Greater scale of an ad tech product—as measured by its adoption by advertisers and publishers—is important because of indirect network effects. All else equal, a product with greater advertiser adoption is more attractive to publishers, and a product with greater adoption by publishers is more attractive to advertisers.

(201) [redacted]

(202) Similarly, a publisher likely derives greater value from selling impressions through an ad exchange if there are more advertisers bidding through that exchange as well. This follows from the economic result that having more bidders in an auction tends to increase competition and the payment made to the seller.[263] [redacted]

[261] [redacted]

[262] [redacted]

[263] Hal R. Varian, *Intermediate Microeconomics*, 9th ed. (New York: W.W. Norton & Company, 2014), 342 ("The general principle is that the expected revenue will keep increasing as the number of bidders increases, but it will do so at a slower rate."). *See also* Jeremy Bulow and Paul Klemperer, "Auctions Versus Negotiations," *American Economic Review* 86, no. 1 (1996); Lance Brannman, J. Douglass Klein, and Leonard W. Weiss, "The Price Effects of Increased Competition in Auction Markets," *Review of Economics & Statistics* 69, no. 1 (1987): 31 ("In this paper we have examined the theoretical and empirical relationships between price and the number of bidders in a variety of auction markets. An obvious and important result is the very significant positive effect of the number of bidders on buying price…regardless of the specific index used.").

[264] [redacted]

[redacted]

(203) Having more customers using an ad tech product, thus, tends to make that product more attractive to other types of customers through indirect network effects. This increases adoption and, in turn, further increases the value of the product. This phenomenon is referred to as a positive feedback loop.[266]

(204) As another example of this phenomenon, if an advertiser ad network can bid on a greater amount of open-web display inventory from publishers, the ad network becomes more attractive to advertisers as a bidding tool to use for their campaigns. If more advertisers use the ad network and allocate a greater budget to be spent on it, the network's yield and monetization performance for publishers likely increases. This increase can arise from greater competition among advertisers, as well as from better "matches" between advertisers and publishers' impressions (generated by the users visiting publishers' websites).[267] Greater performance of the network then attracts even more publishers, which then attracts more advertisers, and so on.

[redacted]

265 [redacted]

266 *See, e.g.,* Carl Shapiro and Hal R. Varian, *Information Rules: A Strategic Guide to the Network Economy* (Boston: Harvard Business School Press, 1999), 224 (The "main lessons to take away from the economics of networks and positive feedback" include that "[p]ositive feedback is the dynamic process by which the strong get stronger. But there is a dark side to the force: positive feedback also makes the weak get weaker" and "[p]ositive feedback works to the advantage of large networks and against small networks.") (emphases suppressed).

267 *See, e.g.,* Zikun Ye, Dennis J. Zhang, Heng Zhang, Renyu Zhang, Xin Chen, and Zhiwei Xu, "Cold Start to Improve Market Thickness on Online Advertising Platforms: Data-Driven Algorithms and Field Experiments," *Management Science* 69, no. 7 (2023), 3839 ("If the number of ad impressions remains the same, a thicker market implies a higher revenue for the platform, with a decreasing marginal return. This is because, with higher market thickness, on one hand, some user impressions that would otherwise be left unmatched can be matched with suitable ads and, on the other hand, the ads have more intensive competitions in the auctions on the platform."). More generally, in other settings, *see also* David S. Evans, "The Antitrust Economics of Multi-Sided Platform Markets," *Yale Journal on Regulation* 20, no. 2 (2003), 332 ("Generally, in matchmaking markets customers of each type benefit from being able to search a larger group of customers of the other type for a suitable match") and 334 ("Each member of a group values the service more highly if there are more members of the other group, thereby increasing the likelihood of a match and reducing the time it takes to find an acceptable match"); David S. Evans and Richard Schmalensee, "The Antitrust Analysis of Multisided Platform Businesses," *Oxford Handbook of International Antitrust Economics,* Volume 1, eds. Roger D. Blair and D. Daniel Sokol (2015), 410 ("A usage externality exists when two economic agents need to act together, to use the platform, to create value…OpenTable and similar businesses help generate these usage externalities by making it easier for restaurants and diners to enter into this transaction. They also increase the value of usage externalities by increasing the quality of the matches: they make it easier for people to find the best restaurant for the particular occasion

(205) [redacted]

(206) [redacted]

[redacted]

(207) That network effects tend to be persistent is also well-documented in the economics literature.[272] In particular, it may be difficult for customers to coordinate on which product to use, and hence any

involved.").

268 [redacted]

269 [redacted]

[redacted]

272 *See*, e.g., Hal R. Varian, "Competition and Market Power," *The Economics of Information Technology: An Introduction* (Cambridge: Cambridge University Press, 2004), 36–37 ("Network effects are clearly prominent in some high-technology industries. . . . Once a firm has established market dominance with a particular product, it can be extremely hard to unseat it."); Bruno Jullien, Alessandro Pavan, and Marc Rysman, "Two-sided Markets, Pricing, and Network Effects," in *Handbook of Industrial Organization*, Volume 4, eds. Kate Ho, Ali Hortaçsu, and Alessandro Lizzeri

product that manages to attract enough customers may find itself keeping those customers and continuing to attract more.[273] Moreover, this persistence can be exacerbated if there are meaningful switching or multihoming costs. Such costs reduce the likelihood that customers, after adopting a product, will use a rival; hence, any network effects generated by those customers will tend to stay with their initial product. For these reasons, network effects generated by a product's customers can be a source of market power and create barriers to entry.[274]

(208) In Section V, I discuss network effects further when examining Google's market power and barriers to entry for advertiser ad network, exchange, and publisher ad server products.

III.D.2. Greater usage improves scale economies for an ad tech product

(209) [redacted] As a result, ad tech products likely exhibit traditional "economies of scale": if an ad

(2021), 488 ("As a product with network effects diffuses into the market, it becomes more valuable and drives further adoption. Indirect network effects thus lead to a feedback loop as more participants on each side of the platform find it more valuable to adopt and use the platform when they expect the other side to attract more users. This phenomenon leads to efficiencies as more market participants are able to interact with each other but also, in some circumstances, market power, as network effects can protect platform owners from entry. In markets with low marginal costs, as is the case for many digital markets, platforms with strong network effects can grow to be enormous and eventually dominate the market."); Joseph Farrell and Garth Saloner, "Installed Base and Compatibility: Innovation, Product Preannouncements, and Predation," *American Economic Review* 76, no. 5 (1986), 940–955.

273 *See, e.g.,* Joseph Farrell and Garth Saloner, "Standardization, compatibility, and innovation," *RAND Journal of Economics* 16, no. 1 (1985), 70-83.

274 *See, e.g.,* Preston McAfee, *Competitive Solutions: The Strategist's Toolkit* (Princeton: Princeton University Press, 2002), 75–76 ("Ownership of a network good can be incredibly valuable, because entry against an established incumbent is so difficult … entrants must enter at a massive scale to challenge the value created by the incumbent's large network…[which] create[s] an entry barrier, and this barrier permits sustainable profits for the incumbent."); Joseph Farrell and Paul Klemperer, "Coordination and Lock-in: Competition with Switching Costs and Network Effects," in *Handbook of Industrial Organization*, Volume 3, eds. Mark Armstrong and Robert H. Porter (2007), 1967–2072 and 1999–2000 ("While the fat-cat effect gives new entrants an advantage in competing for new customers, it is very hard for them to compete for customers who are already attached to an incumbent. There is also adverse selection: consumers who switch are likely to be less loyal, hence less valuable, ones. So entry may be hard if small-scale entry is impractical, due perhaps to economies of scale, or to network effects. Furthermore, even new consumers may be wary of buying from a new supplier if they know that it can only survive at a large scale, since with switching costs consumers care about the future prospects of the firms they deal with."). *See also* Emilio Calvano and Michele Polo, "Market Power, Competition and Innovation in Digital Markets: A Survey," *Information Economics and Policy* 54 (2021), 1–18.

275 [redacted]

276 *See* Sections V.B.2.b, and V.C.2.b.

tech product serves more impressions, it is able to cover its fixed costs across a greater number of impressions and average costs are likely to be declining as more impressions are won and served.[277]

(210) [redacted]

(211) In his report, Prof. Weintraub provides examples of "economically important costs" for ad tech products, which include costs incurred with running real-time auctions and with competing and bidding within real-time auctions.[279] These costs include engineering costs, infrastructure costs, and labor costs.[280] I rely on these opinions regarding materiality of costs to support my opinion on the presence of economies for scale.

III.D.3. Scale generates data that improves the attractiveness and profitability of ad tech products and facilitates experimentation

(212) Greater scale (as measured by usage of the product) allows an ad tech product to collect more data and improve the attractiveness of its products for its customers. This improved attractiveness takes the form of generating higher returns for advertisers and greater expected monetization for publishers. Additionally, the data that is generated from greater scale also can be used to improve the profitability for the firm offering the ad tech product.

(213) Some of the examples that I discuss in this section are based on methods that are studied and used in economics. For example, the economics literature has detailed how additional data can also be used to

[277] B. Douglas Bernheim and Michael D. Whinston, *Microeconomics*, 2nd ed. (New York: McGraw-Hill Irwin, 2014), 271 ("A firm experiences economies of scale when its average cost falls as it produces more. This occurs when cost rises less, proportionately, than the increase in output."). *See also* Hal R. Varian, *Intermediate Microeconomics*, 9th ed. (New York: WW Norton, 2014), 360 ("it could happen that if we scale up both inputs by some factor *t*, we get *more* than *t* times as much output. This is called the case of increasing returns to scale."); B. Douglas Bernheim and Michael D. Whinston, *Microeconomics*, 2nd ed. (New York: McGraw-Hill Irwin, 2014), 272 ("When a firm's input prices do not vary with the amount it produces, it experiences economies of scale if it has an increasing returns to scale technology.").

[278] [redacted]

[279] Expert Report of Gabriel Weintraub, Ph.D., United States of America, et al., v. Google, LLC, Case No. 1:23-cv-00108, December 22, 2023 (hereinafter, "Weintraub Report"), Section III.D.

[280] Weintraub Report, Section III.D.

improve certain methods such as prediction, machine learning, and estimation.[281] [redacted]

(214) In reaching my opinions on the importance of scale and data for the competitiveness of ad tech products, I rely on the following conclusions expressed by Prof. Weintraub and Prof. Ravi regarding the importance of scale for generating data that improves ad tech product quality, and for experimentation:

- Prof. Weintraub opines that scale generates data, which enables the development and training of algorithms and improves the quality of ad tech products (on both the "buy side," representing bidding tools, and the "sell side," representing publisher ad servers and ad exchanges),[283] and scale assists companies with running informative experiments used to evaluate new product features.[284] In particular, Prof. Weintraub reaches the following opinions on these topics:
  - On the buy side, Prof. Weintraub opines that data at scale are used to determine the quality and value of impressions, to develop real-time bidding strategies, and to evaluate the intensity of competition for impressions.[285]
  - On the sell side, Prof. Weintraub opines that data at scale are used to improve algorithms for reserve price optimization, to detect fraud, to evaluate the best buyers for particular impressions (termed "curation"), and to dynamically adjust take rates.[286]

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[281] *See, e.g.*, Hal R. Varian, "Big Data: New Tricks for Econometrics," *Journal of Economic Perspectives* 28, no. 2 (2014), 3 ("Conventional statistical and econometric techniques such as regression often work well, but there are issues unique to big datasets that may require different tools. First, the sheer size of the data involved may require more powerful data manipulation tools. Second, we may have more potential predictors than appropriate for estimation, so we need to do some kind of variable selection. Third, large datasets may allow for more flexible relationships than simple linear models. Machine learning technique such as decision trees, support vector machines, neural nets, deep learning, and so on may allow for more effective ways to model complex relationships."). *See also* Sendhil Mullainathan and Jann Spiess, "Machine Learning: An Applied Econometric Approach." *Journal of Economic Perspectives* 31, no. 2 (2017), 87–106; Alexandre Belloni, Victor Chernozhukov, and Christian Hansen, "High-Dimensional Methods and Inference on Structural and Treatment Effects," *Journal of Economic Perspectives* 28, no. 2 (2014), 29–50; and Emilio Calvano and Michele Polo, "Market Power, Competition, and Innovation in Digital Markets: A Survey," *Information Economics and Policy* 54 (2021), 14 ("Many digital firms' core business is that of making *predictions* of various sorts. … These predictions are made through statistical models (i.e. algorithms) fed by the vast amount of data that online businesses harness on their consumers.").

[282] [redacted]

[283] Weintraub Report, Section III.B

[284] Weintraub Report, Section III.C

[285] Weintraub Report, Section III.B.2.

[286] Weintraub Report, Section III.B.2.

- Prof. Weintraub also opines that data at scale are used by both buy side and sell side ad tech platforms to predict ad click-through rates, which are important for an ad tech products' ability to charge advertisers to pay on a cost-per-click basis and pay publishers on a CPM basis.[287]
- [redacted]

- Prof. Ravi opines that "Transaction scale" (i.e., a higher rate of completed transactions) improves product quality by providing ad tech products with more data and inputs that provide (i) better information for pricing, (ii) better scheduling and targeting opportunities, and (iii) more data for experimentation.[289]

(215) Below, I discuss academic literature, Google documents, and testimony from third parties that corroborate these opinions.

(216) **Scale and data help improve the attractiveness of ad tech products.** There are several ways in which data improves the attractiveness of ad tech products.

(217) [redacted] This is corroborated by findings and discussion in the academic literature.[292]

[287] Weintraub Report, Section III.B.2.

[288] [redacted]

[289] Expert Report of Ramamoorthi Ravi, Ph.D., United States of America, et al., v. Google, LLC, Case No. 1:23-cv-00108, December 22, 2023, Section IV.A.

[290] [redacted]

[292] Academic literature has found that "[m]ore precise targeting generally increases ad effectiveness by delivering ads that are in consumers' interests." For that reason, advertisers may "augment their own proprietary data (e.g., purchase patterns on the advertiser's website) with additional data bought from third parties (e.g., income level, job history, home ownership, monthly car payment) to build targeting audience profiles" while "[p]ublishers seek to integrate their own proprietary data (e.g., user registration information and ad viewing patterns on the publisher's website) with third-party data to build user segments and to offer better targeting options to advertisers at potentially higher prices." Hana Choi,

(218) [redacted]

(219) [redacted]

Carl F. Mela, Santiago R. Balseiro, and Adam Leary, "Online Display Advertising Markets: A Literature Review and Future Directions," *Information Systems Research* 31, no. 2 (2020), 563, 558. Theoretical models have also shown that improved targeting can increase advertisers' value. *See, e.g.*, Dirk Bergemann and Alessandro Bonatti, "Targeting in Advertising Markets: Implications for Offline Versus Online Media," *RAND Journal of Economics* 42, no. 3 (2011), 417–433.

293 [redacted]

294 [redacted]

295 [redacted]

296 *See* Google, "How forecasting works," Google Ad Manager Help, accessed December 15, 2023, https://support.google.com/admanager/answer/7649125. *See also* [redacted]

[redacted]

(220) [redacted] and its research has acknowledged that "Google has a robust experimental infrastructure for running randomized A/B experiments."[299]

(221) [redacted] Moreover, another Google document indicated that it had enough data and publisher customers to apply an experiment to a small share of each publisher's traffic (so as not to materially affect the publisher's revenue) while still obtaining a large aggregate amount of traffic.[303]

[redacted]

297 [redacted]

298 [redacted]

299 Deepak Ravichandran and Nitish Korula, "Effect of Disabling Third-Party Cookies on Publisher Revenue," Google Services, last modified August 27, 2019, *available at* https://services.google.com/fh/files/misc/disabling_third-party_cookies_publisher_revenue.pdf. Google highlighted this research in its Ads & Commerce Blog. *See* Chetna Bindra, "Next Steps to Ensure Transparency, Choice and Control in Digital Advertising," *Google Ads & Commerce Blog*, last modified August 22, 2019, *available at* https://blog.google/products/ads/next-steps-transparency-choice-control/.

300 [redacted]

303 Deepak Ravichandran and Nitish Korula, "Effect of Disabling Third-Party Cookies on Publisher Revenue," Google Services, last modified, August 27, 2019, *available at* https://services.google.com/fh/files/misc/disabling_third-party_cookies_publisher_revenue.pdf ("The experiment was applied to a small fraction of each publisher's traffic because we did not want to materially affect publisher revenue, though in aggregate the amount of traffic evaluated as

(222) [redacted]

(223) [redacted]

(224) **Third-party testimony** [redacted]

[redacted]

part of the experiment was significant.").

304 [redacted]

305 *See* Section VII.D.1.b for a discussion of AdX DRS. [redacted]

306 *See* Appendix L.4 for a discussion of Project Bernanke. [redacted].

307 [redacted]

308 [redacted]

[redacted]

III.E. Economics of auctions

(225) A substantial share of open-web display advertising is currently sold via auction using ad tech products (see Section II.A.4). In this Section, I overview of basic economic concepts regarding auctions, which provides useful context for the products and conduct covered by this report.

(226) An auction is a sales process characterized by the simultaneous consideration of offers ("bids") from multiple interested buyers. Auctions are often used for price discovery when the items being sold are not the same and the number of potential buyers varies, and can result in greater revenues for sellers

[redacted]

IV. Market definition

(241) Market definition is a tool for analyzing antitrust and monopolization claims. Defining relevant antitrust markets identifies a set of products over which an alleged or potential monopolist could possess and exercise market power. In doing so, it assists in the evaluation of whether the alleged or potential monopolist is able to engage in exclusionary conduct and whether such conduct likely harms competition and customers.

(242) Market definition is helpful for at least two reasons. First, market definition focuses attention on and delineate where potential competitive effects from particular conduct are most likely to occur. Second, market definition allows for the calculation of market shares and concentration measures which can be useful for examining the extent of market power. However, as I discuss further below, the market definition exercise properly applied does not necessarily lead to a single antitrust market. Appropriate relevant markets are those that help evaluate the competitive effects of the conduct at issue.

(243) In this section, I evaluate relevant antitrust markets for examining Google's market power and the competitive effects of its conduct on open-web display ad tech products.[330]

(244) A relevant market has both a product and geographic dimension.[331] In this matter, the complaint alleges three relevant product markets: *publisher ad servers*, *ad exchanges*, and *advertiser ad networks* that can be used to serve or transact open-web display advertising. The complaint also alleges a worldwide (with some countries and regions excluded) and United States geographic market for each of these product markets. In this section, I explain why each of these three product markets is a relevant product market, and why both the whole world (excluding certain countries and regions) and the United States are relevant geographic markets for each product market.[332]

(245) This section is organized as follows.

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[330] As I discussed in Section I.B, I was asked by counsel at the Department of Justice to "determine whether publisher ad servers, ad exchanges, and advertiser ad networks for open-web display advertising, both worldwide (excluding countries like the People's Republic of China that substantially restrict internet access) and in the United States, are relevant antitrust markets for the purpose of evaluating Google's market power and the alleged anticompetitive conduct."

[331] United States Department of Justice and Federal Trade Commission, *Horizontal Merger Guidelines*, August 19, 2010 (hereinafter, "HMG"), § 4 ("market definition helps specify the line of commerce and section of the country in which the competitive concern arises."). Additionally, using the label "relevant" serves to differentiate the analytic construct of a relevant market from other uses of the term "market": *see* HMG § 4 ("Relevant antitrust markets defined according to the hypothetical monopolist test are not always intuitive and may not align with how industry members use the term 'market.'"); Jonathan B. Baker, "Market Definition: An Analytical Overview," *Antitrust Law Journal* 74, no. 1 (2007): 130 (labeling markets as relevant or antitrust markets "distinguish[es] these markets from what business executives and consultants might define for other purposes.").

[332] My conclusions regarding Google's market power in the relevant product markets and the competitive effects of its conduct are not changed whether I consider a worldwide or US geographic market.

- In Section IV.A, I discuss economic issues regarding market definition for monopolization claims in ad tech products, and describe the economic framework that I use to define relevant antitrust markets.[333]
- In Section IV.B, I describe why open-web display advertising is an important and distinct form of advertising for open-web publishers and advertisers. Note that the relevant product markets do not contain the underlying display advertisements themselves, but rather the ad tech products used to serve and transact these ads. Nonetheless, focusing on the distinction between display and other forms of advertising clarifies why ad tech products that transact open-web display ads are particularly valued by publishers and advertisers, and why products that do not offer such functionalities are not close substitutes. In this Section, I also discuss why indirect deals for open-web display advertising provide distinct value to publishers and advertisers compared to other forms of transacting display advertising.
- In Sections IV.C–IV.E, I explain why *publisher ad servers*, *ad exchanges*, and *advertiser ad networks*—ad tech products that are used by publishers and advertisers to serve and transact open-web display advertising—are each relevant product markets.
- In Section IV.F, I explain why worldwide (excluding certain countries and regions) and the United States are both appropriate relevant geographic markets for all three relevant product markets.

IV.A. Market definition for monopolization claims in the ad tech stack

(246) For purposes of evaluating the monopolization claims in this matter, a relevant market contains products offered by the alleged monopolist (Google) and those alternative products that would impose significant competitive constraints on Google's products were Google's products priced at competitive levels. Focusing on alternatives that would constrain Google's exercise of market power were its products priced at competitive levels is important, as it identifies alternatives that, if not (potentially already) weakened or eliminated by Google's anticompetitive conduct, would prevent Google from exercising or continuing to exercise market power to the detriment of customers and consumers. Importantly, products that lie *outside* of the relevant market are relatively poor substitutes for competitively-priced products within the market, and customer substitution to these products would not be sufficient to constrain Google's ability to exercise market power in the relevant markets at issue.

(247) As made clear by this discussion, market definition focuses on the ability and willingness of customers to substitute among different products.[334] Relevant markets must contain enough

[333] In this report, when I say that I "define" relevant markets, I mean that I am evaluating whether the markets as described in my assignment are relevant antitrust markets.

[334] HMG, § 4 ("Market definition focuses solely on demand substitution factors, i.e., on customers' ability and willingness

reasonably close substitutes so that an exercise of significant market power by a monopolist of such products would not be rendered unprofitable by sufficient customer substitution to products outside of the market; but at the same time, a relevant market does not necessarily (or typically) include *all* potential substitutes for those products, since it is not necessary to control (or eliminate) all potential substitutes for a monopolist to exercise significant market power.

IV.A.1. The hypothetical monopolist test for monopolization claims

(248) To determine whether a set of products (within a geographic area) comprises a relevant market for the purposes of evaluating monopolization claims, I evaluate whether a "hypothetical monopolist" that owned these products would likely sell at least some of its products profitably to some set of customers at (quality-adjusted) prices[335] that significantly exceed levels that would be charged in a competitive market.

(249) Whether a set of products comprising a relevant market can profitably be monopolized depends on customer substitution patterns. To see why, consider a candidate set of products being evaluated as a possible relevant product market. If a hypothetical monopolist of this set of products would not maximize its profits by charging prices significantly above competitive levels, then there likely exists substantial customer substitution to alternative products *outside* of the candidate market if prices increased from competitive levels. In this case, the candidate market is too narrow and excludes products that are close substitutes to products within the market. If, in contrast, a hypothetical monopolist of a set of products would maximize its profits by charging prices significantly above competitive levels, then products outside of the market are not close substitutes for competitively-priced products within the market, and do not constrain the exercise of market power by the monopolist. In this case, the candidate set of products forms a relevant product market for the purposes of evaluating a monopolization claim.

(250) This economic framework for defining relevant markets is the "hypothetical monopolist test" (HMT) which is commonly used to define markets for the analysis of horizontal mergers.[336] However, there

to substitute away from one product to another in response to a price increase or a corresponding non-price change such as a reduction in product quality or service").

[335] The discussion in this Section uses a price increase as the focal means of exercising market power for a hypothetical monopolist. However, market power can also be exercised by reducing product quality, which can have the effect of reducing costs or increasing customer demand for the firm's other products on which the firm earns supracompetitive profits. The term "quality-adjusted" refers to the possibility that a firm (e.g., the alleged or hypothetical monopolist) would choose to exercise its market power not necessarily by increasing price, but potentially by reducing the quality of a product below that which would be offered in a competitive market. Lowering a product's quality while holding its price fixed is referred to in economics as increasing the quality-adjusted price for the product. In my report, a reference to a "price increase" includes this possibility of a quality-adjusted price increase. *See* HMG §1 ("Enhanced market power can also be manifested in non-price terms and conditions that adversely affect customers, including reduced product quality, reduced product variety, reduced service or diminished innovation.").

[336] HMG §§ 4, 4.1.1 ("The hypothetical monopolist test requires that a product market contain enough substitute products so that it could be subject to post-merger exercise of market power significantly exceeding that existing absent the

is an important difference in implementing the HMT for monopolization claims. In a horizontal merger case, the HMT examines whether a hypothetical monopolist can increase prices for a set of products significantly above *those that would likely be charged absent the merger*, which often are taken to be prevailing pre-merger prices.[337] By evaluating price increases starting from prevailing prices, the HMT in a horizontal merger setting aims to identify products that would likely constrain the merging parties from engaging in an exercise of increased market power following the merger.

(251) In contrast, for monopolization claims, the HMT considers customer substitution patterns at the benchmark of competitive prices.[338] This is because an important concern is that *prevailing prices may already reflect the exercise of substantial market power by the alleged monopolist*.[339] At such elevated prices, consumers would likely substitute away from the alleged monopolist's products to alternatives were the alleged monopolist to impose a further price increase—even if those alternatives are not close substitutes for the alleged monopolist's products *were the monopolist's products priced more competitively*. When there is a concern that prevailing prices (or product qualities) depart significantly from those that would otherwise obtain in a more competitive environment, relying on observed customer substitution patterns at existing price or quality levels risks overstating the competitive significance of more distant substitutes that customers only turn to after a set of products has already been monopolized.[340] Hence, quantitative estimates of demand elasticities and other

merger. Specifically, the test requires that a hypothetical profit-maximizing firm, not subject to price regulation, that was the only present and future seller of those products ("hypothetical monopolist") likely would impose at least a small but significant and non-transitory increase in price ("SSNIP") on at least one product in the market, including at least one product sold by one of the merging firms.").

337 HMG §§ 4, 4.1.2 ("The Agencies apply the SSNIP [small but significant and non-transitory increase in price] starting from prices that would likely prevail absent the merger. If prices are not likely to change absent the merger, these benchmark prices can reasonably be taken to be the prices prevailing prior to the merger. If prices are likely to change absent the merger, e.g., because of innovation or entry, the Agencies may use anticipated future prices as the benchmark for the test.").

338 By competitive prices, I am referring to prices that likely would be offered if there were multiple efficient providers of similar and functionally substitutable products, limited not only to those currently available from existing market participants (e.g., products that could have been or could be offered by existing, past, or potential market participants). By using this benchmark level of prices in the hypothetical monopolist test (defined below), I seek to identify a set of products that could be, or *could already have been*, profitably monopolized.

339 Indeed, acknowledging issues with using consumer substitution at observed prevailing prices to define markets in monopolization cases, the *Horizontal Merger Guidelines* note that a monopolist's current prices may already reflect the exercise of its market power and that market definition in such cases will differ from evaluating horizontal mergers. HMG at fn. 5 ("Market definition for the evaluation of non-merger antitrust concerns such as monopolization or facilitating practices will differ [from mergers] in this respect [referring to the relevant benchmark for prices] if the effects resulting from the conduct of concern are already occurring at the time of evaluation.").

340 Phillip E. Areeda and Herbert Hovenkamp, *Antitrust Law: An Analysis of Antitrust Principles and Their Application*, 4th and 5th ed., cum sup. 2013–2020 (New York: CCH Incorporated, 2020), ¶ 539 ("A first approximation 'provisional market' is in fact a relevant antitrust market if its prices are already significantly supracompetitive. Such a market definition would be incorrectly broadened by adding a second product or region that would make a further price increase unprofitable to the first firm or set of firms. To put it another way, in seeking out a profit-maximizing price the monopolist or oligopolist finds a price so high that a still further price increase would be unprofitable because too many sales would be lost."). *See also* Massimo Motta, *Competition Policy: Theory and Practice*, (New York: Cambridge University Press, 2004), 105 ("Suppose for instance that the firm is the only seller in the correctly defined product market. Being a monopolist, it might have set its prices at such a high level that a further increase above the current prices would not be profitable. Therefore, the [HMT] test [using the monopolist's current prices as the competitive

measures of customer substitution computed at prevailing or historically observed prices will typically be less useful for defining markets for monopolization claims than for horizontal mergers.[341]

(252) Where it is possible that prevailing prices exceed competitive levels, it is useful to consider two categories of evidence that can inform whether competition from products outside the relevant product markets significantly constrains a hypothetical monopolist of products within a market from exercising market power.

(253) First, product characteristics and customer behavior can indicate products outside of each relevant market are not close enough substitutes for competitively-priced products within each relevant market to constrain a monopolist of all such products from exercising significant market power. I provide such evidence in this section. In particular,

- I discuss evidence that open-web display advertising is a distinct and important form of advertising and monetization for advertisers and publishers, and that publisher ad servers, ad

benchmark] might lead to a too-wide market definition, which in turn might lead to a calculation of small market shares, and to a finding of no dominance, for the firm under investigation.").

Relying on substitution patterns to identify substitutes at already "supracompetitive" prices has been referred to as the "Cellophane Fallacy" *See* Steven C. Salop, "The First Principles Approach to Antitrust, Kodak, and Antitrust at the Millennium," *Antitrust Law Journal*, vol. 68, (2000), 188 –189, 197 ("[M]arket power should be measured as the power profitably to raise or maintain price above the competitive benchmark price, which is the price that would prevail in the absence of the alleged anticompetitive restraint. The competitive benchmark may be the current price, the perfectly competitive price, or some other in-between price, depending on the particular allegations of anticompetitive effect being asserted. …Suppose, for example, that the antitrust allegation is that certain conduct has already permitted a firm to raise its price. In these circumstances, the proper competitive benchmark is not the current price. Instead, it is the lower price that would have prevailed absent the alleged restraint. If the current price is used as the competitive benchmark, the result will be an erroneous finding of no market power. This is the error that occurred in the Du Pont case, which now is explained under the rubric of the Cellophane Trap, or Cellophane Fallacy. There, Du Pont engaged in a variety of conduct that eliminated competition, permitting Du Pont to raise its price. The Court, however, evaluated market definition as a threshold filter that focused on the profitability of price increases above the already achieved monopolized price. That hypothetical price increase was found to be unprofitable, leading the Court to affirm the finding of a broad market and a lack of market power by Du Pont.") (emphases suppressed). *See also* Gene C. Schaerr, "The Cellophane Fallacy and the Justice Department's Guidelines for Horizontal Mergers," *Yale Law Journal* 94, no. 3 (1985), 670–93.

341 *See, e.g.*, Dennis W. Carlton and Jeffrey M. Perloff, *Modern Industrial Organization*, 4th ed. (Boston: Addison-Wesley, 2005), 646–647 ("Just because a monopolized product faces close demand substitutes at monopoly price, it does not follow that the firm producing the product has no market power (though it may not be able to raise price further). It is only if the substitution possibilities are so large as to generate a highly elastic residual demand that the monopoly has no significant market power. Because it is difficult to determine which products to include in the market definition, market shares may be only a crude indicator of market power. The *Cellophane* case illustrates these difficulties in defining a market. The Court investigated whether du Pont had market power in the pricing of cellophane. The Court reasoned that du Pont lacked market power because, at the current market prices, a user of cellophane had many substitutes, such as paper bags, and du Pont's share of the market including these substitutes was not large. There was also evidence, however, that price substantially exceeded marginal cost. Based on the foregoing discussion, it was an error to include other wrapping materials in the market definition because they did not prevent the exercise of market power and constrain the price of cellophane to competitive levels. If, however, instead of asking whether du Pont had market power, the Court had investigated whether a proposed merger would raise the cellophane price, its market definition might have been appropriate.").

exchanges and advertiser ad networks that facilitate the serving and sale of such advertising are each distinct sets of products without close substitutes for *either* advertisers or publishers.[342]

- I also discuss evidence that industry participants recognize products in each relevant market as offering features and capabilities to customers that are not offered by products outside of the market, which is also consistent with the conclusion that a hypothetical monopolist of products within the market would not be constrained from charging prices above competitive levels.
- I also provide quantitative evidence that supports the finding that products outside the market are not close substitutes from customers' perspectives.

(254) Second, I present direct evidence that Google possesses substantial and sustained market power with its publisher ad server (DFP), ad exchange (AdX), and advertiser ad network (Google Ads) products. Such evidence indicates that these are proper relevant markets: because Google was able to profitably exercise market power in these markets, a hypothetical monopolist that controlled Google's products as well as their close substitutes would also find it profitable to do so.[343] Direct evidence of Google's market power for these products includes Google's pricing behavior and ability to profitably implement certain policies contrary to the interests of publishers and/or advertisers without a sufficient competitive response to constrain Google's actions. This evidence shows that these relevant markets can be profitably monopolized.[344] Evidence of Google's market power over products contained within the relevant markets also demonstrates that potential constraints imposed by indirect network effects (or Google's sale of multiple complementary products) do not prevent it—nor a hypothetical monopolist within each market—from charging quality-adjusted prices above competitive levels.

IV.A.2. Relevant markets typically exclude some substitutes, and may exclude alternatives that are used alongside products within the relevant markets

(255) Despite its usefulness in productively focusing attention on areas where competitive concerns may arise, market definition is not "an end in itself" and is one of several tools that assist with the analysis

[342] Recall from Section III.B that an ad tech product will possess market power as long as *either* the advertisers or publishers that use it do not have close substitutes to turn to. Hence, as long as one set of customers (advertisers or publishers) lack close substitutes for a set of products, a monopolist of those products will be able to exercise market power and those products would comprise a relevant market.

[343] *See* Phillip E. Areeda and Herbert Hovenkamp, *Antitrust Law: An Analysis of Antitrust Principles and Their Application*, 4th and 5th ed., cum sup. 2013–2020 (New York: CCH Incorporated, 2020), ¶ 539b1 ("Where the provisional *A* grouping [of products] includes all reasonable substitutes made in the same region and by similar technology, substantial excess profits, prices significantly above marginal costs, or some instances of price discrimination reveal market power within that grouping. That conclusion overcomes the presumptive methodology for broadening the market. Indeed, there is seldom any reason to do more than conclude that the *A* grouping defines a market, once we know that the *A* firms possess substantial market power.").

[344] Notably, this direct evidence does not involve market shares computed for a given set of products (which would depend upon having defined a relevant market).

of competitive effects.[345] In particular, since market definition involves labeling products as inside or outside of a market, it inevitably draws a discrete boundary around products even when there are more nuanced measures of firms' competitive positions.[346]

(256) One implication is that a relevant market will often exclude products that *some* customers view as substitutes for products within the market.[347] The key consideration when defining markets for monopolization claims is whether those excluded substitutes pose a *significant enough competitive constraint* on products contained within the market so as to prevent a hypothetical monopolist of those products from exercising market power and charging prices above competitive levels. By excluding alternative products that would be unlikely to constrain a monopolist (e.g., because a sufficient number of consumers view those alternatives as poor substitutes for products within the market), market definition facilitates the calculation of market shares and concentration measures that do not overstate the competitive significance of distant substitutes.[348]

(257) This is important to bear in mind when defining markets for products that facilitate the serving and sale of open-web display advertising, as there exist products outside of the relevant markets defined in this report that may be used alongside products within the relevant markets by advertisers or publishers.[349] Similarly, a publisher may use multiple transaction types, including direct guaranteed deals as well as indirect deals. In addition, an advertiser may elect to purchase online display advertising on both open-web publishers and mobile apps, or use both video and display ads for a particular advertising campaign.

(258) [redacted]

[345] *See, e.g.*, HMG § 4 ("When the Agencies identify a potential competitive concern with a horizontal merger, market definition plays two roles. First, market definition helps specify the line of commerce and section of the country in which the competitive concern arises. In any merger enforcement action, the Agencies will normally identify one or more relevant markets in which the merger may substantially lessen competition. Second, market definition allows the Agencies to identify market participants and measure market shares and market concentration. *See* Section 5. The measurement of market shares and market concentration is not an end in itself, but is useful to the extent it illuminates the merger's likely competitive effects.").

[346] HMG § 4 ("[D]efining a market to include some substitutes and exclude others is inevitably a simplification that cannot capture the full variation in the extent to which different products compete against each other… Relevant markets need not have precise metes and bounds.").

[347] HMG, § 4.1.1 ("Groups of products may satisfy the hypothetical monopolist test without including the full range of substitutes from which customers choose. The hypothetical monopolist test may identify a group of products as a relevant market even if customers would substitute significantly to products outside that group in response to a price increase.").

[348] HMG, § 4 ("Market shares of different products in narrowly defined markets are more likely to capture the relative competitive significance of these products, and often more accurately reflect competition between close substitutes. As a result, properly defined antitrust markets often exclude some substitutes to which some customers might turn in the face of a price increase even if such substitutes provide alternatives for those customers.").

[349] For example, an open-web publisher may choose to monetize parts of its website using display advertising using a publisher ad server, and other parts of its website (such as at the bottom of one of its "interior" or non-home/non-landing pages) using content recommendation advertising products. *See* discussion of content recommendation engines in Section II.A; *see also* discussion in Section IV.B.1.

[redacted] As long as a set of competitively-priced products more efficiently monetize open-web inventory for publishers or more effectively accomplish a particular need for advertisers than alternatives, those products likely will be able to be profitably monopolized and comprise a relevant product market.

(259) As an analogy, to be able to perform a wide variety of repairs around the home, a person likely needs to have both a screwdriver and a hammer in their toolbox. Although a screwdriver and a screw might be able to accomplish what a hammer and a nail could do for some tasks (for instance, hanging a picture on the wall), this does not mean that someone would be able to do away with having a hammer altogether—there are tasks that a hammer is uniquely suited for and well positioned to perform. Indeed, it is unlikely that the existence of screwdrivers would be able to prevent a hypothetical monopolist of hammers from profitably charging prices above competitive levels. And vice versa: for the same reasons, it is unlikely that the existence of hammers would be able to prevent a hypothetical monopolist of screwdrivers from profitably charging prices above competitive levels.

(260) Similarly, even though some publishers may choose to monetize their online content using *both* in-stream video and display advertising, this fact alone does not mean a hypothetical monopolist of publisher ad servers for display advertising would be constrained in its ability to exercise market

[350] *See* [redacted]

power by ad servers that only facilitated the sale of instream video ads. A publisher's "monetization toolbox" will likely require many different sorts of tools.[351]

IV.B. Open-web display advertising is a distinct and important form of advertising for publishers and advertisers

(261) In this section, I discuss why open-web display advertising is a distinct and valuable form of advertising for open-web publishers and advertisers. Within open-web display advertising, I also discuss why *indirect* transactions in particular provide additional value to publishers and advertisers.

(262) Establishing the importance of open-web display advertising compared to other forms of advertising supports each of the relevant product markets that I discuss in Sections IV.C−IV.E below. This is because if open-web display advertising is distinct and valuable for open-web publishers and advertisers, then these customers would have limited ability to substitute away from *products used to transact such advertising* if those products were priced higher than competitive levels.

(263) For publishers and advertisers, open-web display advertising satisfies a particular functionality and use case more efficiently or effectively than alternatives. As I discuss in more detail below, digital advertising is distinct from "offline," or non-digital, advertising. In addition, within the broad category of digital advertising, there are important distinctions between open-web display advertising and other forms of digital advertising from the perspective of both publishers and advertisers that make them not close substitutes. Though the substitutability of open-web display advertising from alternatives will differ across these two sets of customers, as I discussed in Section III.B, products that facilitate the sale of open-web display advertising can comprise a relevant antitrust market even if *only* one of those two sets—publishers or advertisers—do not have close substitutes outside of the market.

(264) The rest of this Section is organized as follows:

- In Section IV.B.1, I discuss why publishers obtain distinct value from open-web display advertising relative to other sources of monetization, and why other forms of monetization—although potentially used alongside open-web display advertising for some publishers—are differentiated from publishers' perspectives.
- In Section IV.B.2, I discuss why advertisers obtain distinct value from open-web display advertising relative to other forms of digital and non-digital advertising, and why open-web

[351] Analogously, advertisers may engage in both search and display advertising at the same time, but this does not mean that search advertising tools constrain a hypothetical monopolist of open-web display ad tech products from exercising market power. As I discuss further below, display advertising has features that are distinct and valued by advertisers, and advertisers often use a portfolio of advertising products to achieve their goals and reach different audiences.

display advertising is differentiated from other forms of advertising from advertisers' perspectives.

- In Section IV.B.3, consistent with the above, I show evidence that Google and other industry participants recognize important distinctions between open-web display advertising and other forms of advertising.
- In Section IV.B.4, I discuss why indirect transactions, and RTB transactions in particular, for open-web display advertising provide additional distinct value to publishers and advertisers compared to direct transactions.

IV.B.1. Open-web display advertising is an important and distinct form of monetization for publishers

(265) Open-web publishers relying on advertising to monetize their digital content often use a portfolio of different forms of advertising.[352] In this Section, I discuss why open-web display advertising forms an important part of the monetization portfolio for open-web publishers, and why such publishers will tend to have limited ability to substitute away from display advertising to other forms of advertising. I also discuss why open-web publishers without their own integrated ad tech products cannot easily substitute to using integrated advertising tools to sell display advertising.

(266) Note that open-web publishers that monetize at least some of their web inventory via digital advertising would not likely find substituting completely away from advertising to a consumer-payment model (e.g., subscriptions) to be a close substitute. For publishers that do not currently have a consumer-payment model, adopting a new monetization strategy can be costly and difficult.[353] In particular, a publisher that attempts to adopt a consumer-payment model from scratch must induce consumers to pay for its content, market its product to new customers, and deliver enough value to keep its customers paying. For publishers that already have a consumer-payment model, substituting completely away from advertising would mean forgoing a valuable source of additional revenue.

IV.B.1.a. The sale of display advertising is distinct from other forms of advertising from the perspective of open-web publishers

(267) From the perspective of open-web publishers, the sale of display advertising is distinct from selling other forms of advertising. There are two primary reasons for this. First, a publisher may not have content that is suitable for other forms of advertising, such as instream video or in-app content.

[352] *See* Section IV.A.2.

[353] As one academic paper notes, so-called "free-to-fee" changes between advertising to subscription-based models are challenging for publishers because of the tendency of consumers to place a lower value on free (or discounted) content and resist paying for content that had been free (or discounted). Pontus Huotari and Paavo Ritala, "When to Switch between Subscription-based and Ad-sponsored Business Models: Strategic Implications of Decreasing Content Novelty," *Journal of Business Research* 129 (2021), 14–28.

Second, even among the set of advertising options available to a publisher given its content, there is significant differentiation between display advertising and other forms of advertising.

IV.B.1.a.i. Publishers' advertising options are limited by the content they provide

(268) A publisher's options for using advertising to monetize a particular piece of online content is limited by the nature of the content itself.

(269) Perhaps most obviously, a publisher with *online* content cannot generally sell *offline* advertising to directly monetize that online content. Similarly, publishers cannot monetize their *web* properties by selling *in-app* ads.[354] Offline and in-app ads fundamentally monetize different advertising inventory than web ads.

(270) [redacted]

IV.B.1.a.ii. Display advertising is differentiated from other available options from a publisher's perspective

(271) Even for publishers who have advertising options other than display advertising for the content they offer, display advertising is significantly differentiated from other forms of digital advertising.

(272) **Instream Video.** [redacted]

[354] Many online publishers also do not have a mobile app: Google data show that in 2022, 83% of AdX web publishers sold no mobile app or tablet app impressions (Google XPP-D data (DOJ RFP 7)). This figure excludes transactions where Google sold its owned-and-operated inventory through AdX.

[355] [redacted]

[redacted]

(273) [redacted]

(274) These price differences are consistent with instream video and display ads not being close substitutes from publishers' perspectives, and there being constraints on publishers' abilities to re-allocate their advertising space away from display ads and toward instream video ads to take advantage of the higher monetization rate.

(275) **In-app.** As discussed above, even for publishers that have both a mobile application and a web site, in-app and open-web display advertising are not close substitutes. This is primarily because *in-app* display ads cannot monetize the publisher's *web* inventory (and vice versa); such a publisher would likely use both in-app and open-web display ads if it chose to monetize its digital properties with display advertising. Additionally, web impressions and app impressions for such publishers may attract different audiences and users.[359] [redacted] Forgoing open-web advertising would mean forgoing additional advertising sales for those web impressions.

[356] [redacted]

[357] [redacted]

[358] [redacted].

[359] *See* Section II.A.2, IV.B.1.a, IV.B.2.b.

[360] Google XPP-D data (DOJ RFP 7).

(276) **Native.** [redacted]

(277) [redacted] Similarly, in-feed native ads are distinct from display ads because they occupy slots *within* (as opposed to above and around) publishers' content.[363]

(278) [redacted]

[361] [redacted]

[362] [redacted]

[363] *See* Section II.A.

[364] [redacted]

[365] Google, "About ad units," Google AdSense Help, https://support.google.com/adsense/answer/9183549. *See also* [redacted] Per Google, "Traffic Multiplex ads (retired)," Google Ad Manager Help, https://support.google.com/admanager/answer/9428537?hl=en, (Multiplex was

[redacted]

IV.B.1.b. Open-web publishers cannot easily substitute to selling display advertising inventory with their own integrated advertising tools

(279) Open-web publishers rely on third-party ad tech products to sell their ad inventory. [redacted]

retired in July 2023).

366 [redacted]

369 [redacted]

370 [redacted]

(280) [redacted]

(281) [redacted]

IV.B.2. Open-web display advertising is an important component of marketing for advertisers, and distinct from other forms of advertising

(282) [redacted]

(283) [redacted]

371 [redacted]

373 [redacted]

374 [redacted]

375 [redacted]

376 [redacted] *see also* Google, "What's online marketing?," https://support.google.com/google-ads/answer/6227161?sjid=780273546632133046 4-NA ("There's a lot that's different

[redacted] Additionally, digital advertising enables advertisers to more accurately track and quickly respond to the effectiveness of their ads.[378] [redacted]

(284) Below, I discuss evidence that within digital advertising, display advertising on websites provides distinct value to advertisers as compared to other forms of digital advertising; and that for advertisers, open-web display advertising is distinct from display advertising on web sites of publishers that rely on their own integrated ad-tech products for the sale of display inventory.

IV.B.2.a. Display advertising on websites is distinct from other forms of digital advertising for advertisers

(285) Many advertisers use multiple forms of digital advertising. Marketing research and documents and testimony from industry participants acknowledge that different forms of advertising can target users at different stages of what is referred to as the "marketing funnel" (or, equivalently "sales funnel").[380]

[redacted]

[redacted]

377 [redacted] *See also* Google, "What's online marketing?," https://support.google.com/google-ads/answer/6227161?sjid=7802735466321330464-NA ("you can use different targeting methods to reach potential customers right when they're searching for your products or services. This can help make sure you're putting your advertising dollars towards reaching only the people most likely to become your customers.").

378 Google, "What's online marketing?," https://support.google.com/google-ads/answer/6227161?sjid=7802735466321330464-NA; Avi Goldfarb, "What is Different about Online Advertising?", *Review of Industrial Organization* 44, no. 2 (2014), 120.

379 [redacted]

380 *See* Section II.A.2.

381 [redacted]

(286) Below, I describe relevant distinctions between web display and other forms of digital advertising for advertisers.

(287) **Search.** [redacted]

Figure 28. [redacted]

[redacted]

[redacted]

382 [redacted]

(288) [redacted]

(289) [redacted]

(290) **Instream video**. [redacted] Google recommends that advertisers use instream video ads "when you have video content you'd like to promote before, during, or after other videos" while outstream ads are preferable for advertisers who "want to expand the reach of your video ads … helping you reach more customers."[389]

[383] [redacted] Google, "About Display ads and the Google Display Network," https://support.google.com/google-ads/answer/2404190; [redacted].

[384] [redacted]

[385] [redacted]

[386] [redacted]. On its Google Ads Help page, Google notes that search campaigns are "great for driving sales, leads, or traffic to your website" while display campaigns are a "great way to expand your reach and stay top of mind with an audience beyond just Google Search." (Google, "Choose the right campaign type," https://support.google.com/google-ads/answer/2567043?sjid=7802735466321330464-NA).

[387] [redacted]

[388] Google, "'In-stream ad' or 'In-display ad'", https://support.google.com/google-ads/thread/1468899/in-stream-ad-or-in-display-ad; [redacted]

[389] Google, "About video ad formats," Google Ads Help, accessed December 19, 2023, https://support.google.com/google-ads/answer/2375464?hl=en.

(291) Instream video advertising also serves a distinct purpose for advertisers relative to web display ads.[390]

[redacted]

(292) **Native advertising.** Native advertising is also distinct from web display advertising from an advertiser's perspective.[392] Whereas traditional banner display ads are distinguishable from a publisher's content, native ads are styled to blend into the format of a publisher's site.[393]

(293) [redacted]

(294) In Section II.A, I described three prominent forms of native ads: sponsored listing, social, and content recommendation. There is evidence that each form is distinct from display advertising from an advertiser's perspective.

- [redacted]
- Social in-feed ads are shown on social media websites. An executive from GroupM, a media agency, noted that social media and display advertising are complements for advertisers and that

390 *See* Section II.A for a discussion of the differences between instream and outstream video ads. There, I note I follow industry convention and include outstream video ads within display ads. I also include transactions involving outstream video ads in my calculation of market shares.

391 [redacted]

392 Erin Hynes, "Native Ads vs. Display Ads and when to use each," StackAdapt, May 5, 2022, https://blog.stackadapt.com/role-of-native-advertising-vs-display; Laura Kloot, "Native Ads vs. Display Ads: What are the differences?" Outbrain, accessed December 19, 2023, https://www.outbrain.com/blog/native-ads-vs-display-ads/.

393 Google, "About native ads," Google Ad Manager Help, accessed December 19, 2023, https://support.google.com/admanager/answer/6366845.

394 [redacted]

395 [redacted]

[redacted][8] Moreover, some advertisers who boycotted Facebook in June 2020 and left Twitter in late-2022 also explicitly stated that they planned to reallocate their spend to other social media sites such as Pinterest, Snapchat, LinkedIn, and Tiktok.[399]

(295) Distinctions between open-web display and social media advertising are also evident in Google's descriptions for its "Discovery Ads" product for ads placed on Google's "O&O feed-like

[redacted]

399 *See, e.g.*, Aisha Counts, "X Unlikely to Win Back Advertisers Before Holiday Season", *Bloomberg*, Sep. 14, 2023, https://www.bloomberg.com/news/articles/2023-09-14/x-unlikely-to-win-back-advertisers-before-holiday-season ("None of Tinuiti's [a marketing firm] advertisers plan to buy ads on X during the holidays and instead are increasing spending on Facebook, Instagram, TikTok and even Snapchat. Twitter "was a part of every plan," said Jason Harris, CEO of ad agency Mekanism, which works with clients including Alaska Airlines, Charles Schwab and Dropbox. "Now brands, our clients, are pivoting away from it more towards stable platforms like TikTok or Reels or even YouTube Shorts," he said."); Ryan Mac and Kate Conger, "X May Lose Up to $75 Million in Revenue as More Advertisers Pull Out," *New York Times*, Nov. 24, 2023, available at https://www.nytimes.com/2023/11/24/business/x-elon-musk-advertisers.html ("Leesha Anderson, the vice president of digital marketing and social media at the advertising agency Outcast, said its clients steadily stopped spending on X after Mr. Musk took over and had found alternatives on platforms like LinkedIn and TikTok."); Subrat Patnaik, "Snap Investors Hope for Advertising Windfall as Brands Ditch Musk's Twitter, *Bloomberg*, Dec. 6, 2022, available at https://www.bloomberg.com/news/articles/2022-12-06/snap-snap-bulls-hope-for-advertising-windfall-as-brands-ditch-twitter ("Snap Inc., one of the smaller social media networks, may be among the biggest beneficiaries of Twitter's loss of advertisers. Twitter could lose almost a third of its ad revenue as brands pull back from the site, according to estimates from MKM Partners LLC. Meta Platforms Inc.'s Instagram and Facebook would win the biggest chunk of that business.").

properties."[400] Figure 29 and Figure 30 below are two slides from a June 2020 presentation, noting how Discovery Ads is "positioned against Facebook" (which does not offer open-web display ad tech products),[401] and how social ads target different segments of advertiser spend than its display ad products.[402]

[redacted]

[400] [redacted]

[401] [redacted].

[402] [redacted]

Figure 30. [redacted]

(296) [redacted]

(297) [redacted]

403 [redacted] MMA Mobile Native Advertising Committee, "The Mobile Native Ad Formats," *Mobile Marketing Association*, https://www.mmaglobal.com/files/documents/the_mobile_native_formats_final.pdf.

406 [redacted]

[redacted]

(298) To summarize, the various types of digital advertising discussed above have important differences for advertisers. In addition to reach and targeting differences discussed above, forms of advertising can be differentiated by their "cost model"—that is, whether advertisers are charged and publishers are paid out on a per-click (CPC), per impression (CPM) or per view (CPV) basis.[408] I discuss these distinctions in more detail in Section IV.E below.

IV.B.2.b. Open-web advertising is distinct from advertising on applications or on websites using integrated advertising tools

(299) As I explained in Section II.A.1, open-web advertising consists of advertising on web publishers that use non-integrated ad tech products to sell their online display inventory. From the perspective of advertisers, such advertising is distinct from advertising on applications, or on websites for publishers (such as Amazon and large social media companies including Facebook and Twitter) that sell their owned-and-operated online display inventory using integrated, proprietary ad tech products. This is for several reasons.

(300) [redacted] According to a 2020 survey, consumers spend nearly two-thirds of their online time on properties not owned by major technology companies (such as Facebook, Instagram, Amazon, etc. that use their own

[407] [redacted]

[408] *See* Figure 79 in Appendix C, which summarizes the differences in ad format, cost model, and targeting capabilities between digital advertising types.

[409] *See, e.g.*, [redacted]. *See also* Figure 42 below in Section V.B.2.a.

integrated ad technology).[410] Limiting advertising to only websites and apps with their own integrated advertising sales limits advertisers' reach from a large portion of online web inventory.[411]

(301) Second, open-web display advertising and advertising on applications or publishers with their own integrated ad tech tools can reach different groups of consumers, or reach similar groups of consumers at different times. Consistent with this, many advertisers advertise on both open-web publishers and on online properties with integrated advertising sales. [redacted] Additionally, in-app advertisements may be seen primarily by smartphone users, who have different characteristics than web users that are reached by web-display advertising.[413]

(302) [redacted]

(303) [redacted]

[410] A 2020 survey conducted by The Harris Poll on behalf of OpenX, from a sample of 2,000 users in the United States defined open web as "any property, website or app that is not owned by a major technology company (Facebook/Instagram, Amazon, Youtube). Examples of 'the open web' include sites and apps like The New York Times, CNN, BuzzFeed, ESPN, Weather.com, All-recipes.com, as well as apps like Words With Friends, Angry Birds or Weatherbug." The survey also noted that consumers stated that they are more likely to find relevant and impactful advertisements on the open web than on Facebook, Instagram, or Amazon. OpenX, "The Open Web vs. the Walled Gardens: Consumer Preferences & The Opportunity for Brand Marketers," OpenX, https://s3.amazonaws.com/media.mediapost.com/uploads/OpenWebVsWalledGardens.pdf; *See also* OpenX, "Walled Gardens VS. Open Web Research Report 2020," https://www.openx.com/thought-leadership/walled-gardens-vs-open-web-research-report-2020/, which found that "84% of consumers turn to the Open Web first for information on a business."

[411] *See* Figure 42 in Section V.B.2.a regarding the size of "addressable" and "unaddressable" ad inventory.

[412] [redacted]

[413] IAB Europe, "IAB Europe's Guide to In-App Advertising," IAB Europe, February 2022,, https://iabeurope.eu/wp-content/uploads/2022/02/IAB-Europe-Guide-to-In-app-advertising.pptx.pdf ("As [the audience for in-app advertising] is highly comprised of heavy smartphone users they tend to trend younger and more affluent than traditional web users").

[414] [redacted] Google, "About Display ads and the Google Display Network," Google Ads Help, https://support.google.com/google-ads/answer/2404190 (GDN "Display campaigns can reach people worldwide across 35 million websites and apps").

[redacted] In contrast, open-web advertising allows advertisers to coordinate spending and budgeting across many open-web publishers through bidding tools such as ad networks and DSPs.

IV.B.3. Industry participants recognize the distinctiveness of open-web display advertising

(304) Evidence from Google and other industry participants acknowledge important distinctions between open-web display advertising and other forms of digital advertising that limit their substitutability from publishers' and advertisers' perspectives.

(305) Consistent with the distinctions described above, Google's documents indicate the distinctiveness of open-web display advertising relative to other forms of digital advertising. For example:

[redacted]

415 [redacted]

417 [redacted]

[redacted]

(306) [redacted]

[redacted]

422 [redacted]

[redacted]

- [redacted]
- [redacted]
- An IAB Internet Advertising Revenue Report from 2021 assessed the growth rates of digital audio, digital video, social, search, and display advertising separately, relative to total internet advertising revenue growth.[432] The report noted that in 2021, search represented 41.4% of internet advertising revenues, while display and digital video made up 30% and 20.9%, respectively. While search maintained the largest share, video saw the most growth in revenue in 2021.[433] IAB also differentiates in-app from web advertising, calling in-app advertising "a highly desirable and differentiated product."[434]

IV.B.4. Indirect transactions for open-web display advertising provide additional distinct value to publishers and advertisers

(307) [redacted]

[redacted]

429 [redacted]

[redacted]

432 IAB, "Internet Advertising Revenue Report," PWC and IAB, April 2022, https://www.iab.com/wp-content/uploads/2022/04/IAB_Internet_Advertising_Revenue_Report_Full_Year_2021.pdf.

433 IAB, "Internet Advertising Revenue Report," PWC and IAB, April 2022, https://www.iab.com/wp-content/uploads/2022/04/IAB_Internet_Advertising_Revenue_Report_Full_Year_2021.pdf.

434 IAB Europe, "Guide to in-app advertising," IAB Europe, February 2022, 29, https://iabeurope.eu/wp-content/uploads/2022/02/IAB-Europe-Guide-to-In-app-advertising.pptx.pdf.

435 [redacted]

436 [redacted]

Figure 31. [redacted]

(308) [redacted]

437 [redacted]

(309) There are important distinctions between indirect and direct transactions for open-web display advertising from the perspectives of both publishers and advertisers.

(310) [redacted]

[redacted]

441 [redacted]

442 [redacted] The IAB notes that indirect deals enable inventory "to be bought at the highest price and there doesn't have to be a pre-existing agreement between the advertiser and the seller." IAB, "Back to Basics Guide to Programmatic," IAB, https://www.iabuk.com/standards-guidelines/back-basics-guide-programmatic#number2.

443 [redacted]

444 [redacted]

(312) [redacted] Indirect transactions also enable advertisers to "tailor their bids and ads in real time to buy the ad space they value the most."[447] [redacted]

(313) [redacted]

(314) [redacted]

[redacted]

[447] Neal Mohan, "A year of the new DoubleClick Ad Exchange: improving large publishers' returns," Google Official Blog,(blog), Jan. 16, 2011, https://googleblog.blogspot.com/2011/01/year-of-new-doubleclick-ad-exchange.html.

[redacted]

[redacted]

Figure 32. [redacted]

IV.C. Publisher ad servers is a relevant product market

(315) [redacted]

451 [redacted]

452 [redacted]

[redacted]

(316) [redacted][4] They typically also provide other features such as collecting and utilizing targeting information, and tracking ad performance and monetization.[455] Publisher multihoming across multiple publisher ad servers for display advertising is rare, and publishers typically use a single publisher ad server for display ads.[456]

(317) [redacted]

[redacted]

[455] *See* discussion in Section II.B.1.

[456] *See* discussion in Section III.C, fn. 246.

[redacted]

[redacted]

(318) Google's publisher ad server is DoubleClick for Publishers (DFP), which is part of Google Ad Manager (GAM).[460] GAM is available in two versions: GAM and GAM 360, the latter of which contains greater functionality than the former.[461] [redacted] Other publisher ad servers available to open-web publishers include those offered by Equativ (formerly Smart) and Xandr (formerly AppNexus).[463]

(319) In this section, I explain why there is a relevant antitrust market for publisher ad servers, reviewing:

1. Qualitative evidence regarding the lack of close alternatives to publisher ad servers from the perspective of open-web publishers;
2. Industry recognition that publisher ad servers are a distinct product with functionality substantially different from other ad tech products; and
3. Additional evidence that publisher ad servers lack close substitutes, including direct evidence that Google *already* exercises substantial market power with respect to its publisher ad server product (DFP) that I present in detail in Section V.B.3.

(320) The discussion in this Section establishes the limited substitutability of publisher ad servers relative to alternatives from the perspective of open-web publishers. As I discussed in Section III.C, demonstrating that publishers alone have limited alternative options for a set of open-web ad tech products is sufficient for the purposes of establishing that a firm owning those products would possess market power. Indeed, even *if* advertisers could perfectly substitute away from display advertising on open-web publishers using publisher ad servers in response to higher advertising prices (which is unlikely), this would not prevent a hypothetical monopolist of publisher ad servers from

[redacted]

460 *See* discussion in Section II.C.1.

461 *See* discussion in Section II.C.

462 [redacted]

463 *See* discussion in Section II.B.1.

exercising market power over publishers, due to the lack of close substitutes from the perspective of open-web publishers alone.[464]

(321) Thus, I conclude that a profit-maximizing hypothetical monopolist of publisher ad servers would likely raise quality-adjusted prices substantially over competitive levels, and that therefore publisher ad servers is a relevant product market.

IV.C.1. Open-web publishers lack effective substitutes for publisher ad servers

(322) In Section IV.B.1, I showed that open-web display advertising is an important and distinct form of monetization for open-web publishers, and that other forms of advertising are imperfect substitutes. Here, I discuss why for those publishers seeking to monetize their open-web inventory via display advertising, publisher ad servers lack effective substitutes.

(323) [redacted]

(324) I consider each possibility in turn and discuss why these are not close substitutes to using a publisher ad server.

(325) [redacted]

[464] That is, in this example, publisher ad server fees would be borne by publishers, potentially in the form of reduced publisher payouts. There is significant evidence that advertisers would also not perfectly substitute away from open-web display advertising available through publisher ad servers if those products charged prices above competitive levels for advertiser access. As I discussed in Section IV.B.2, other forms of advertising are not effective substitutes for open-web display advertising for advertisers. In order to access open-web display inventory of a publisher using a publisher ad server, advertisers typically would have to interact either directly or indirectly with that publisher's ad server. Given that a substantial number of open-web publishers would continue using a publisher ad server even if prices for publisher ad servers exceed competitive levels, an advertiser likely foregoes potentially substantial returns on its advertising investment by completely refusing to engage with publisher ad servers. This logic also applies to firms competing for and representing the demand of advertisers, from the perspective of a publisher, such as ad agencies, advertiser ad networks and DSPs.

[465] *See* Section II.C.3.b for a description of AdSense.

[466] [redacted]

[467] By "publisher ad servers," for market definition purposes, I mean a publisher ad servers provided by a third party, and not a publisher's self-provision of these services. Self-provision of a publisher ad server is not considered to be in the market for publisher ad servers, but could provide competitive discipline to a hypothetical monopolist of publisher ad servers.

[redacted]

(326) Consider next the second option. A publisher could choose to rely solely on direct deals with advertisers and forego indirect deals entirely, potentially eliminating the need for a publisher ad server that selects among multiple direct and indirect deals. As I discussed above, such a strategy is

[redacted]

[470] *See* Google, "Compare Ad Manager, AdSense, and AdMob," https://support.google.com/admanager/ answer/9234653 (accessed December 20,2023) ("AdSense is best for publishers who want more automation for their ad solutions, and have a small dedicated ad management team" whereas "Google Ad Manager is an ad management platform for large publishers who have significant direct sales. Ad Manager provides granular controls and supports multiple ad exchanges and networks."; *see also* [redacted] *See also* discussion in Section II.C.3.b.

[471] [redacted]

[redacted]

(327) [redacted]

[redacted]

[476] For example, a publisher ad server can manage delivery pacing, the rate at which impressions are delivered during the span of a direct deal. DFP measures traffic and can forecast future traffic to hit a line item's impression total according to a publisher and an advertiser's specifications. *See* Google, "How line item delivery is paced," Google Ad Manager Help, https://support.google.com/admanager/answer/2669484?sjid=7351782279263672648-NA; [redacted]

(328) A third alternative to using a (third-party) publisher ad server is developing an integrated, internally managed publisher ad server. However, only larger publishers with particular reasons to forego third-party ad serving tend to engage in such an option,[477] even in the presence of Google's substantial market power in publisher ad servers. This is the case for at least two primary reasons:

[redacted]

- Second, a publisher with its own open-web publisher ad server would not have unrestricted access to and use of real-time bids from AdX, due to Google's exclusive provision of such access

[redacted]

[477] As I describe in Section IV.B.1.b, there are particular reasons why some publishers may opt to develop their own integrated advertising products.

[478] [redacted]

and use to DFP. In Section VII.C, I describe this conduct further and discuss evidence that this significantly reduces publishers' incentives to use an alternative to DFP.

IV.C.2. Industry participants recognize that publisher ad servers are a distinct product

(329) Industry participants and observers recognize that publisher ad servers are distinct from other ad tech products used to transact open-web display advertising, indicating that substitution to other products would likely be limited in response to an exercise of market power by a hypothetical monopolist of competitively-priced publisher ad servers.

(330) As I discussed in Section II.B and II.C, various Google documents and testimony from its executives distinguish between publisher ad servers and other ad tech products, and recognize that the role of publisher ad servers is distinct from those of ad exchanges and advertiser ad networks.[479]

[redacted]

[479] For example, see Figure 19 in Section II.B.

[480] [redacted]

[481] [redacted]. ClearCode, "The Main Technology Platforms and Intermediaries in the Digital Advertising Ecosystem," *The Ad Tech Book* Ch. 4, https://adtechbook.clearcode.cc/adtech-platforms-and-intermediaries/.

IV.C.3. A hypothetical monopolist of publisher ad servers would likely charge quality-adjusted prices above competitive levels

(332) A profit-maximizing hypothetical monopolist of publisher ad servers would likely charge (quality-adjusted) prices that significantly exceed competitive levels.[485] Such a hypothetical monopolist likely would do so due to the lack of close alternatives available to open-web publishers, as discussed above. These publishers can be targeted with price increases individually or by offering different versions of the product targeted to different consumer types.[486]

(333) Moreover, as I will detail further in Section V.B, there is direct evidence that Google's publisher ad server product, DFP, possesses significant market power. In that section, I describe Google documents indicating higher DFP fees would increase its profit. I also discuss DFP's deviations from competitive behavior, including actions it took to reduce its quality in order to meaningfully advantage AdX. All of this indicates evidence that Google faces limited constraints on its market power from customer substitution away from DFP.

(334) Hence, publisher ad servers is a relevant product market.

IV.D. Ad exchanges is a relevant product market

(335) [redacted]

[485] A monopolist of publisher ad servers that also owned complementary products might also exercise market power in the publisher ad server market by reducing its quality to increase sales of complementary products (see Section V.B.3.b).

[486] As I discussed in Section II.D, Google offers two versions of DFP (Premium and Small Business) with different fees, and as I discuss in Section V.C.3, there is evidence that Google is able to charge varying prices for DFP Premium to different publishers.

[487] [redacted]

[488] [redacted]

[489] [redacted]

(336) [redacted]

(337) In this section, I explain why there is a relevant antitrust market for ad exchanges, reviewing:

1. Qualitative evidence regarding the lack of close substitutes to ad exchanges from the perspective of publishers and advertisers;
2. Industry recognition that ad exchanges are a distinct product with functionality substantially different from that of other ad tech products;
3. Additional evidence that there are few close alternatives to ad exchanges, including direct evidence of Google's substantial market power with respect to its ad exchange product (AdX) that I present in further detail in Section V.C.3.

(338) For the above reasons, I conclude that a profit-maximizing hypothetical monopolist of ad exchanges would likely raise quality-adjusted prices significantly over competitive levels, and therefore that ad exchanges is a relevant product market.

IV.D.1. Open-web publishers and advertisers lack close substitutes for ad exchanges

(339) In Section IV.B I described the distinctiveness of open-web display advertising sold via indirect transactions relative to other forms of advertising from the perspective of publishers and advertisers. Here, I examine potential alternatives to ad exchanges that are theoretically available to publishers and advertisers seeking to advertise their products through open-web display advertising and describe why these alternatives are not close substitutes. Potential alternatives include direct deals and other ad tech products including publisher ad servers, DSPs, and advertiser ad networks.

(340) [redacted]

490 [redacted]

491 [redacted]t

(341) Next, I discuss potential alternatives to ad exchanges for both publishers and advertisers.

(342) [redacted]

(343) Second, for publishers, publisher ad servers are not close substitutes for ad exchanges. The services provided by publisher ad servers are largely complementary to those provided by ad exchanges. Ad exchanges connect with and run real-time auctions among DSPs and other demand partners, and then typically submit the winning bid for consideration by a publisher's publisher ad server against other real-time bids or direct deals.[494] [redacted]

(344) Third, for advertisers, DSPs are not close substitutes for ad exchanges. DSPs provide programmatic ad purchasing services and bidding optimization services for advertisers and ad agencies, and

[redacted]

492 "Initially, publishers sold space to advertisers via direct sales by finding advertisers willing to display their ads on their websites…Direct sales brought about the problem of fill risk; because some inventory could end up unsold, there was a need for an intermediary, a technological platform that would efficiently sell remnant inventory and automate the process. That's where the ad network came in… When real-time bidding (RTB) was introduced in the late 2000s, network optimizers [that worked with ad networks] morphed into a new type of AdTech platform, which we know today as supply-side platforms (SSPs)." Michal Wlosik and Maciej Zawadzinski, "What is a Supply-Side Platform (SSP) and How Does It Work?," Clearcode, October 18, 2018, https://clearcode.cc/blog/what-is-supply-side-platform/. *See* Section II.D.4 for more information.

493 [redacted].

494 As I discussed in Section II.E, this submission may occur either directly or indirectly through header bidding.

495 *See* Section IV.B.4.

496 [redacted]

primarily rely on ad exchanges to bid on open-web display inventory. [redacted]

(345) [redacted]

[497] [redacted]

[498] [redacted] Google's current recommended "best practice" for AdX is "deactivating AdSense when using Ad Exchange" as "AdSense and Ad Exchange can't be called at the same time." (Google, "Best Practices for Ad Exchange Line Items," Google Ad Manager Help, https://support.google.com/admanager/answer/7278551?hl=en.). [redacted]

IV.D.2. Industry participants recognize that ad exchanges are a distinct product

(346) Industry participants have recognized the distinctiveness of ad exchanges relative to other ad tech products, indicating that substitution to other products would likely be limited in response to an exercise of market power by a hypothetical monopolist of competitively-priced ad exchanges. For example:

- As discussed in Section II.B, internal Google documents and depictions of the ad tech stack identified ad exchanges as a distinct part of the stack with a distinct set of competitors.[499]

- The Interactive Advertising Bureau ("IAB"), the trade organization that represents the digital advertising community, differentiates between ad exchanges and other ad tech products. While it recognizes that ad networks also provide aggregated inventory to advertisers, it defines ad exchanges as distinct in that they provide a direct sales channel between buyers and sellers and can facilitate automated, auction-based, real-time bidding transactions.[504]

[499] *See, e.g.*, Section II.B, Figure 18 and Figure 19.

[500] [redacted]

[504] IAB, "IAB Glossary of Terminology," IAB, https://www.iab.com/insights/glossary-of-terminology/.

(347) Though Google introduced Google Ad Manager (GAM) in June 2018 which contains both DFP and AdX,[505] [redacted]

IV.D.3. A hypothetical monopolist of ad exchanges would likely charge quality-adjusted prices above a competitive level

(348) A profit-maximizing hypothetical monopolist of ad exchanges providing real-time bids for open-web display ads would likely charge (quality-adjusted) prices that significantly exceed competitive levels. Within open-web display advertising, the market power of such a hypothetical monopolist primarily arises from the position of ad exchanges in the ad tech stack—as the intermediating layer between publishers and their publishers ad servers, and DSPs and advertiser ad networks used by advertisers and ad agencies—and the difficulties in circumventing this layer, as discussed above.

(349) As discussed earlier, because ad exchanges facilitate transactions between two distinct sets of agents, an exercise of market power requires only that *either* (a) publishers (or firms representing their supply from the perspective of ad exchanges) *or* (b) advertisers (or firms representing their demand from the perspective of ad exchanges) would not substantially substitute away from ad exchanges priced above competitive levels. The evidence provided above indicates that substitution by both advertisers and publishers to alternatives would not be sufficient to defeat an exercise of market power by a hypothetical monopolist, and that publishers and advertisers are willing to bear fees significantly above competitive levels to transact display ads through ad exchanges.

(350) Moreover, as I will discuss in detail in Section V.C.3, there is significant direct evidence that Google has been able to exercise substantial market power in the ad exchange market with its AdX product. For example, AdX's take rate of 20% is significantly higher than the average of its competitors and has been stable for the past decade. In addition, Google has been able to dynamically adjust its reserve prices (i.e., price floors) and use AdX to favor its own products in the ad tech stack even while degrading the quality of AdX by not providing real-time bids into rival publisher ad servers. During that time, a range of out-of-market advertisement options have grown in significance. These

[505] *See* discussion in Section II.C, fn.124.

[506] [redacted]

options include "connected" and over-the-top TV services,[508] audio,[509] and social media sites such as TikTok, SnapChat and Facebook.[510] A lack of a price response from AdX, and its ability to degrade the quality of its product without losing substantial share, is consistent with out-of-market options imposing limited constraints on the market power for a hypothetical monopolist of ad exchanges for open-web display.

(351) Hence, ad exchanges is a relevant product market.

IV.E. Advertiser ad networks is a relevant product market

(352) Advertiser ad networks are bidding tools used by advertisers to purchase open-web display inventory.[511] [redacted]

[508] IAB, "IAB internet advertising revenue report: 2018 full year results," PWC and IAB, last modified May 2019, https://www.iab.com/wp-content/uploads/2019/05/Full-Year-2018-IAB-Internet-Advertising-Revenue-Report.pdf. ("As consumers shift away from traditional media, digital leads the way in regaining their attention, first from desktop to mobile devices and more recently to connected TV, audio devices, and digital out of home…"). They echoed the rising significance of TV services for the first half of 2019 in the 2019 first six months results. *See* IAB, "IAB internet advertising revenue report: 2019 first six months results," IAB, October 2019, 5 https://www.iab.com/wp-content/uploads/2019/10/IAB-HY19-Internet-Advertising-Revenue-Report.pdf: "We are firmly in the third revolution of television content… publishers have indicated they are increasingly leveraging OTT to go direct to consumer…As viewers shift their behavior towards CTV, advertisers are following."

[509] IAB, "IAB internet advertising revenue report: 2019 first six months results," IAB, October 2019, 18 https://www.iab.com/wp-content/uploads/2019/10/IAB-HY19-Internet-Advertising-Revenue-Report.pdf: digital audio advertising revenue reached $1.2 billion in HY 2019, "a 30.1% increase over HY 2018 revenue."

[510] IAB, "IAB internet advertising revenue report: 2019 first six months results," IAB, October 2019, 17 https://www.iab.com/wp-content/uploads/2019/10/IAB-HY19-Internet-Advertising-Revenue-Report.pdf: social media advertising total revenue grew 30.6% between FY 2017 and 2018. In IAB, "IAB internet advertising revenue report: 2019 first six months results," IAB, October 2019, 21: "Social media advertising continues its ascent with revenues growing 25.7% in HY 2019 compared to HY 2018."

[511] *See* discussion of ad networks in Section II.B. [redacted]

[redacted] Advertiser ad networks often also provide proprietary data to faciliate audience targeting.[513]

(353) [redacted]

[512] [redacted]

[513] *See* discussion of advertiser ad networks in Section II.B.

[514] [redacted]

[515] [redacted]

(354) Google's advertiser ad network product is Google Ads.[516] [redacted] and Facebook Audience Network ("FAN") provided an advertiser ad network with access to open-web publishers until 2020.[518]

(355) In this section, I explain why there is a relevant antitrust market for advertiser ad networks, reviewing:

1. Qualitative evidence regarding the lack of close alternatives to advertiser ad networks from the perspective of advertisers and open-web publishers;
2. Industry recognition that advertiser ad networks are a distinct product with functionality substantially different from that of other ad tech products;
3. Additional evidence that there are few close alternatives to advertiser ad networks, including direct evidence of Google's substantial market power with respect to its advertiser ad network product (Google Ads) that I present in further detail in Section V.D.3.

(356) Thus, I conclude that a profit-maximizing hypothetical monopolist of advertiser ad networks would likely raise quality-adjusted prices substantially over competitive levels, and that therefore ad networks is a relevant product market.

[redacted]

516 *See* Section II.C.3.

517 [redacted] (Ronan Shields, "CRO Brian Gleason on why Criteo is 'not an ad network,'"*Digiday*, Aug. 22, 2022. https://digiday.com/media/cro-brian-gleason-on-why-criteo-is-not-an-ad-network/). Criteo might be considered both an ad network and a DSP; I am conservative in my analysis of Google Ads' market power by including Criteo in the advertiser ad network market.

518 Allison Schiff, "Facebook Is Killing Off Its Web Supply In Audience Network – And Don't Be Surprised If It All Shuts Down," *AdExchanger*, last modified February 5, 2020, available at https://www.adexchanger.com/platforms/facebook-is-killing-off-its-web-supply-in-audience-network-and-dont-be-surprised-if-it-all-shuts-down/. *See also* Section V.B.2.b for further discussion of Facebook Audience Network. Yahoo (Yahoo! Native) and Microsoft (Microsoft Audience Network) also offer ad network products but focus only on native ads. Yahoo, "Native Advertising," Y!Native, accessed December 21, 2023, https://gemini.yahoo.com/advertiser/home; Microsoft, "Microsoft Audience Network," accessed December 21, 2023, https://about.ads.microsoft.com/en-us/solutions/microsoft-audience-network.

IV.E.1. Advertisers and open-web publishers lack close substitutes for and derive significant value from advertiser ad networks

(357) The market power of a hypothetical monopolist of advertiser ad networks arises from advertisers (or firms representing advertiser demand from the perspective of ad networks) and open-web publishers not having close substitutes.[519] This implies that a hypothetical monopolist of advertiser ad networks would likely be able to charge (quality-adjusted) fees significantly above competitive levels for transacting open-web display advertising without reducing its transaction volume significantly enough for the fee to be unprofitable.

(358) Within open-web display advertising, advertiser ad networks provide value through their provision to smaller, less sophisticated advertisers of an accessible way to purchase open-web display inventory, and their provision to advertisers more broadly the ability to purchase display advertising on a CPC-basis. These features tend to attract unique advertising demand that is not available through DSPs which, in turn, provides open-web publishers seeking to efficiently monetize their online properties significant value from having advertiser ad networks bid on their display inventory than forgoing them altogether.

(359) I discuss these points further below.

IV.E.1.a. Advertisers lack close substitutes for advertiser ad networks

(360) From the perspective of advertisers, alternative methods of accessing open-web display inventory include direct deals and DSPs. These alternatives are not close substitutes for advertiser ad networks.

(361) [redacted] Large advertisers, who may purchase premium inventory through direct deals with large publishers, do not likely view direct deals as a close substitute for indirect sales purchased through advertiser ad networks.[522] [redacted]

[519] Publishers can access advertiser demand through advertiser ad networks directly by calling them from their publisher ad server or header bidding implementation, or indirectly through ad exchanges into which advertiser ad networks bid.

[520] [redacted]

[521] [redacted]

[522] *See* discussion in Section IV.B.4.

[523] [redacted]

(362) [redacted]

[redacted]

(364) [redacted]

[redacted]

Figure 33. [redacted]

(365) Next, there is evidence that pricing structures differ between advertiser ad networks and DSPs, as shown in Figure 34 below. Cost types listed in Figure 34 reflect both payments made by advertisers and payments made to publishers. For example, "CPC-to-CPM" represents transactions in which an advertiser paid for an ad slot on a cost-per-click basis, but the publisher was paid out on a per-impression (cost-per-mille) basis. If only one cost type is listed (e.g., "CPM"), then the cost type was the same for the advertiser and publisher. As depicted in Figure 34, over 80% of Google Ads transactions charge advertisers on a CPC basis, while close to 80% of transactions on DV360 charge advertisers on a CPM basis.[529] [redacted]

[529] "CPMAV" means "cost per mille active view" and "CPA" means "cost per action." *See* Google, "Media purchase options on the Display Network," Google Ads Help, https://support.google.com/google-ads/answer/172621?hl=en.

[530] [redacted]

Figure 34. [redacted]

Note: Worldwide share of billable impressions in 2022. Limited to indirect open-web display impressions. I supplement Google XP data with Google DV360 data as cost type information for DV360 is often missing in the Google XP data. Abbreviations: CPC (cost-per-click), CPM (cost-per-mille impressions), CPMAV (cost-per-mille active view), CPV (cost-per-view), CPA (cost-per-action), CPE (cost-per-engagement). *See* Google, "Glossary," Google Ads Help, https://support.google.com/google-ads/topic/3121777?hl=en. "Other" includes CPA-to-CPM, CPV, CPA, CPE, and CPE-to-CPM transaction types.

(366) [redacted]

(367) Consistent with the above differences between advertiser ad networks from DSPs, the set of advertisers that use these distinct products differ.

(368) Using Google's data, I analyze the set of advertisers that use Google Ads and/or DV360.

(369) [redacted]

[531] [redacted] *See also* Section II.C.4.

Figure 35. [redacted]

(370) [redacted]

Figure 36. [redacted]

(371) [redacted]

Figure 37.

(372)

532

[redacted]

Figure 38. [redacted]

(373) [redacted]

Figure 39. [redacted]

Notes: "Smart campaigns" is functionality within Google Ads. Google, "About Smart campaigns benefits and features," Google Ads Help, https://support.google.com/google-ads/answer/7457632?sjid=8362921333849880277-NA ("Smart campaigns is a Google Ads campaign type that makes it simpler to advertise on Google Search, Google Maps, YouTube, Gmail, and other Google partner websites.").

(374) [redacted]

(375) In sum, the above evidence indicates that DSPs are not close substitutes for advertiser ad networks from advertisers' perspectives.

IV.E.1.b. Open-web publishers derive significant value from advertiser ad networks

(376) [redacted]

534 [redacted]

535 [redacted]

[redacted]

(377) [redacted]

(378) [redacted]

IV.E.2. Industry participants recognize that ad networks are distinct products

(379) Industry participants have recognized the distinctiveness of advertiser ad networks, indicating that substitution to DSPs and other ad tech products would likely be limited in response to an exercise of market power by a hypothetical monopolist of competitively-priced advertiser ad networks. For instance,

- [redacted]

[redacted]

[redacted]

- AdPushup, an ad revenue optimization platform for publishers, distinguishes between ad networks and DSPs. It notes that while DSPs offer more advanced targeting features and optimization capabilities, ad networks offer advertisers a simpler, straightforward buying process and broader reach.[547]

(380) [redacted]

[redacted]

[547] AdPushup, "Ad Network vs DSP: What are the Key Differences," https://www.adpushup.com/blog/ad-network-vs-dsp-comparison.

[redacted]

IV.E.3. A hypothetical monopolist of advertiser ad networks would likely charge quality-adjusted prices above competitive levels

(381) A profit-maximizing hypothetical monopolist of advertiser ad networks would likely charge (quality-adjusted) prices that significantly exceed competitive levels. The market power of such a hypothetical monopolist primarily arises from the uniqueness of advertiser ad networks as a buy-side solution for small advertisers, and the publisher demand for access to advertiser ad networks that arises out of the unique demand accessible through them.

(382) As discussed earlier, because advertiser ad networks facilitate transactions between two distinct sets of agents, an exercise of market power requires only that either (a) publishers (or firms representing their supply from the perspective of advertiser ad networks) or (b) advertisers (or firms representing their demand from the perspective of advertiser ad networks) would not substantially substitute away from advertiser ad networks priced above competitive levels. The evidence provided above indicates that substitution by both advertisers and publishers to alternatives would not be sufficient to defeat an exercise of market power by a hypothetical monopolist, and that publishers and advertisers are willing to bear fees significantly above competitive levels to transact display ads through advertiser ad networks.

(383) Moreover, as I will discuss in detail in Section V.D.3, there is direct evidence that Google has been able to exercise substantial market power in the advertiser ad network market with its Google Ads product. For over a decade, Google Ads has been able to charge fees above competitive levels and meaningfully affect publisher payouts by changing its bidding strategies into AdX. Moreover, Google has imposed constraints on Google Ads' ability to bid into third-party ad exchanges to favor AdX, degrading the quality of Google Ads in the process. Google Ads' ability to engage in such behavior strongly indicates that there are limited constraints on the market power a hypothetical monopolist of advertiser ad networks could exercise.

(384) Hence, advertiser ad networks is a relevant product market.

[548] [redacted]

IV.F. Relevant geographic markets for publisher ad servers, ad exchanges, and advertiser ad networks

(385) Geographic market definition assists with evaluating monopolization claims by focusing attention on, and explicitly delineating, specific geographic areas where competitive and customer harm can occur.

(386) The focus of this matter is on third-party ad tech products that can be used to transact open-web display advertising. The customers of these third-party ad tech products are open-web publishers and advertisers, and the suppliers of these products include software companies such as Google and its competitors in the relevant product markets.

(387) A relevant geographic market can be based on the locations of customers (buyers or sellers of open-web display advertising). In this report, I focus on geographic market definition based on customer location—i.e., where open-web publishers and advertisers are located—and do not place restrictions on the location of suppliers.[549]

(388) Below, I describe why worldwide (excluding a limited number of regions) is a relevant geographic market for publisher ad servers, ad exchanges, and advertiser ad networks. Customers of ad tech products are located around the world, and transactions between open-web publishers and advertiers occur across country boundaries. Suppliers of ad tech products also have a global presence, and enjoy indirect network effects and scale benefits that are not limited to narrow geographic regions. Moreover, the effects of Google's conduct in the ad tech stack, and restrictions it has placed on the use of its products in the relevant product markets, have been imposed in countries around the world, and are not limited to customers within any single country.

(389) The ad tech industry and scope of Google's conduct is thus global. Although there may be some differences in competitive conditions within narrower geographic regions, there are compelling benefits to examining the whole world when examining the competitive significance and effects of Google's conduct within the relevant product markets.

(390) As a general matter, however, there may be multiple relevant geographic markets that are useful for the evaluation of competitive effects.[550] Below, I also describe why the United States is also a relevant geographic market for these product markets.

[549] HMG § 4.2 ("The arena of competition […] may be geographically bounded if geography limits some customers' willingness or ability to substitute to some products, or some suppliers' willingness or ability to serve some customers. Both supplier and customer locations can affect this."). The physical location of suppliers is often not relevant for market definition purposes for software products, such as the ones at issue in this case, where customers do not obtain the product at a supplier's location. *See* HMG § 4.2.1 ("Geographic markets based on the locations of suppliers encompass the region from which sales are made. Geographic markets of this type often apply when customers receive goods or services at suppliers' locations.").

[550] HMG § 4.1.1 ("the hypothetical monopolist test ensures that markets are not defined too narrowly, but it does not lead to

(391) In both cases, geographic restrictions are based on the location of customers (advertisers and open-web publishers) that use publisher ad servers, ad exchanges, and advertiser ad networks; and are not based on the location of suppliers (who may be located worldwide).

IV.F.1. A relevant geographic market for all product markets is worldwide (with certain exceptions)

(392) Worldwide, excluding certain countries and regions, is a relevant geographic market, and is appropriate for evaluating Google's market power in each of the relevant product markets and the competitive effects of its conduct. This is for three main reasons.

(393) [redacted]

(394) For example, Google often reports performance metrics surrounding its ad tech products across three regions—Americas, EMEA (Europe, Middle East, and Africa), and APAC (Asia-Pacific). Figure 40 from a 2018 Google presentation illustrates that although advertiser spending from a region often returns to the sell-side in that region (for example, this is the case for 72% of the spend originating in the Americas), there is a significant share of spending that is spent on the sell-side in other regions.

a single relevant market. The Agencies may evaluate a merger in any relevant market satisfying the test, guided by the overarching principle that the purpose of defining the market and measuring market shares is to illuminate the evaluation of competitive effects.").

551 [redacted]

Figure 40.

(395) Furthermore, as I show in the next Section, Google's market power in the relevant product markets is not limited to a single country or region.

(396) Moreover, ad tech products benefit from scale effects—arising from both indirect network effects (as advertiser and publisher customers transact with one another across geographic regions) and data—that are not necessarily restricted to country-specific boundaries.[553]

(397) Third, Google's conduct that I evaluate in this report is not limited to the boundaries of any one country. Google has imposed restrictions on the use of its Google Ads, AdX, and DFP products by open-web publishers and advertisers located worldwide. Hence, the competitive effects of Google's

[552]

[553] For example, an ad tech product with a worldwide presence can collect data and track users who visit websites operated by publishers that are located in different countries.

conduct extend beyond any individual country's borders, and a worldwide geographic market accounts for this.

(398) To help productively focus attention on areas where Google possesses and exercises market power and where competitive effects of its conduct are most likely to occur, I exclude from the worldwide geographic market the following regions:[554]

- **Countries and regions where Google is restricted from operating due to US sanctions**: The US government places restrictions on working with customers in countries and regions that are subject to US sanctions.[557] These restricted areas include Iran, North Korea, Syria, Cuba, Crimea, Donetsk People's Republic (DNR), and Luhansk People's Republic (LNR).[558]

[554] As I discuss below with regard to a US geographic market, a hypothetical monopolist of any of the relevant product markets would likely be able to engage in discrimination based on customer locations. Hence, even if I were to include these regions within the worldwide geographic market, it would not change my conclusions regarding a hypothetical monopolist's likelihood of profitably charging quality-adjusted prices above competitive levels for customers located elsewhere. Even so, restricting attention to a narrower geographic market has the advantage of not overstating the competitive significance of potential alternatives located in these excluded regions.

[555]

[556]

[557] Google, "Understanding Google Ads country restrictions," Google Ads Help, https://support.google.com/google-ads/answer/6163740?hl=en.

[558] Google, "Understanding AdSense country restrictions," Google AdSense Help, https://support.google.com/adsense/answer/6167308?hl=en; Google, "Understanding Google Ads country restrictions," Google Ads Help, https://support.google.com/google-ads/answer/6163740?hl=en; Google, "Google Publisher Policies," Google Ad Manager Help, https://support.google.com/admanager/answer/10502938?hl=en.

(399) The exclusion of customers within these excluded regions reflects a very small number of total open-web display transactions and, as a result, their inclusion or exclusion does not affect my opinions.[559]

(400) For the rest of this report, when I use "worldwide," I am referring to all countries and regions excluding those described above.

IV.F.2. A relevant geographic market for all product markets is the United States

(401) The United States is also a relevant geographic market for each of the relevant product markets for examining Google's market power and the competitive effects of its conduct. This is for two main reasons.

(402) First, a hypothetical monopolist of all publisher ad servers, ad exchanges, or advertiser ad networks available to customers (advertisers or open-web publishers) located in the United States would likely profitably exercise market power over those customers, and would not likely be constrained by the prices charged by ad tech products available only to open-web publishers and advertisers that are both located outside of the United States. This is because there is significant evidence that a hypothetical monopolist of each of the relevant product markets would be able to engage in price discrimination based on the location of its customers.[560] Indeed, Google has demonstrated its ability to do so in the relevant product markets:

[redacted]

559 [redacted]

560 HMG § 4.2.2 ("When the hypothetical monopolist could discriminate based on customer location, the Agencies may define geographic markets based on the locations of targeted customers.").

561 [redacted] *See* Section II.D for a discussion of fees in the ad tech stack.

562 [redacted]

(403) Google's ability to engage in price discrimination and charge different prices to customers without being constrained by customer substitution implies that a hypothetical monopolist could also engage in a targeted exercise of market power over customers within a particular geographic region.

(404) Hence, a hypothetical monopolist of all products within a relevant product market would likely be able to exercise market power over US customers—and in particular, US open-web publishers—without being constrained by the prices charged for ad tech products only available to customers located outside of the United States.

(405) [redacted]

[redacted] *See also* discussion of dynamic reserve price optimization (RPO) for AdX in Section V.C.3.

[redacted]

(406) For these reasons, the US is also a relevant geographic market for the purposes of analyzing Google's market power and the competitive effects of its conduct.

[redacted]

(426) [redacted]

V.A.2. Economic factors that increase barriers to entry and expansion

(427) Particular economic features of the ad tech stack amplify the value of Google's strategic assets and create barriers to entry and expansion for potential and existing competitors. These features include:

- **Indirect network externalities.** As discussed in Section III.D.1, products in the open-web ad tech stack exhibit indirect network externalities. For example, a successful ad exchange requires enough desirable display inventory to attract buyers to its auctions and enough attractive demand to induce publishers to supply their impressions. As I discuss further in Section VII.C, publishers value the unrestricted real-time access to Google Ads demand through AdX that is provided via

[603] [redacted] In a study crawling the top 1 million websites, Google Analytics third-party trackers appeared on about 70% of sites. Steven Englehardt and Arvind Narayanan, "Online Tracking: A 1-million site Measurement and Analysis," Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security, 1388–1401, https://dl.acm.org/doi/pdf/10.1145/2976749.2978313. [redacted]

[604] [redacted]

uses significant amounts of historical data from within the ad tech stack to forecast future traffic volumes and to dynamically set reserve prices (i.e., price floors) across exchanges within DFP.[622]

V.B.2. Indirect evidence of Google's market power in the publisher ad server market

(436) Google's high market shares, as well as evidence of significant barriers to entry, provide indirect evidence of Google's substantial and sustained market power in the publisher ad server market.

V.B.2.a. Market shares

(437) [redacted]

(438) [redacted]

[622] *See* Section III.D.3 for further details.

[623] [redacted]

[624] [redacted]

[625] [redacted]

Figure 41. [redacted]

(439) [redacted]

626 [redacted]

627 [redacted]

Figure 42. [redacted]

(440) [redacted]

628 [redacted]

Figure 43. [redacted]

(441) [redacted]

Figure 44. [redacted]

(442) [redacted]

630 [redacted]

(443) My analysis of data provided in this matter also corroborates DFP's large share of open-web display impressions served.

(444) Because open-web publishers usually choose at most one publisher ad server for their direct and indirect display advertising needs,[633] publishers will typically value a publisher ad server's ability to serve both of these types of transactions. Hence, I compute market shares based on all impressions served.

(445) [redacted]

[633] *See* discussion in Section III.C, fn. 246.

[redacted]

My market share calculations exclude impressions that DFP serves from Google-owned properties.

[redacted]

Figure 45. [redacted]

V.B.2.b. Barriers to entry and expansion

(446) Competitive entry into the publisher ad server market to an extent that would challenge the dominance of Google's DFP would be extremely difficult.

636 [redacted]

[redacted]

(450) Beyond Facebook and the New York Times, a number of firms have struggled with their publisher ad server offerings in recent years. For example, OpenX closed its ad server product in 2019,[645] and Verizon announced in 2019 its plans to shut down its Oath ad server in 2020.[646]

(451) Barriers to entry and expansion in the publisher ad server market include:

- **Costs of building and maintaining a publisher ad server**. [redacted]
- **Switching costs.** Publishers tend to use a single publisher ad server for web display advertising, and thus gaining share in the market means convincing publishers to switch ad servers. As

[644] [redacted]

[645] Chris Shuptrine, "OpenX Ad Server Alternatives," *Adzerk*, December 19, 2018, https://adzerk.com/blog/openx-ad-server-alternatives/.

[646] Tyrone Stewart, "Verizon Media to shut down ad server," *Mobile Marketing Magazine*, May 3, 2019,

[redacted]

discussed in Section IV.C above, these switching costs are high. [redacted]

- **Indirect network effects**. To attract publishers with a compelling offering, publisher ad servers need to provide sufficient advertiser demand, through access to ad exchanges and other RTB demand sources. To attract advertiser spending though ad exchanges and RTB sources, a publisher ad server needs to provide access to a meaningful amount of publisher inventory.
- [redacted]

V.B.3. Direct evidence of Google's market power in the publisher ad server market

(452) Direct evidence of Google's substantial and sustained market power in the publisher ad server market includes its ability to maintain quality-adjusted prices above competitive levels for DFP, and ability to significantly deviate from competitive behavior by degrading the quality of its DFP product to favor AdX, on which it earns supracompetive profits.

V.B.3.a. Google's DFP is able to maintain quality-adjusted prices above competitive levels

(453) [redacted]

(454) The economics of this strategy are analogous to the familiar add-on or razor/razor-blade pricing model whereby a firm extracts profits on a complementary good (in this case, AdX) while pricing the

[redacted]

primary good (in this case, DFP) close to or even below its direct marginal cost.[655] When customers purchase the primary good first and face high switching costs, a firm may optimally chose to exercise its market power over the primary good by earning profit on the complementary good.[656]

(455) [redacted]

(456) Google documents support the conclusion that Google collects some of its profit from DFP's market power elsewhere in the ad tech stack.[659] For example,

- [redacted]

[redacted]

[659] Google's DFP revenue share is lower than its other products. Google has expressed its ad serving fees for direct deals as a revenue share of around 1%. Bonita Stewart, "A look at how news publishers make money with Ad Manager," Google Ad Manager blog, June 23, 2020, https://blog.google/products/admanager/news-publishers-make-money-ad-manager/ ("Publisher sales teams do the majority of work with direct advertising deals, keeping over 99% of the revenue they manage. With ads served using Google Ad Manager's technology, Google Ad Manager typically retains under 1%.").

[redacted]

(457 [redacted]

660 [redacted]; Sarah Sluis, "Index Exchange Hires Drew Bradstock from Google To Build Forecasting Product," AdExchanger, February 24, 2016, https://www.adexchanger.com/platforms/index-exchange-hires-drew-bradstock-from-google-to-build-forecasting-product/.

661 [redacted]

663 [redacted]

[redacted]

(458) Google internal analyses also are consistent with publishers' limited ability to substitute away from DFP in the event of a price increase. [redacted]

(459) [redacted]

(460) [redacted]

664 [redacted] GCN stands for Google Content Network, which changed to Google Display Network in June 2010 (Google, "Introducing the Google Display Network," *Inside AdWords*, June 18, 2020, https://adwords.googleblog.com/2010/06/introducing-google-display-network.html).

665 The economic literature has discussed a variety of reasons why a firm with substantial market power may choose to price below the short-run or static profit-maximizing level for a given product. These include earning profits on the sale of complementary products, reasons related to switching costs and network effects (e.g., so-called "invest-and-harvest" dynamics), and to deter entry and to deny rivals scale. *See, e.g.,* n. 656 discussing pricing of complementary products and pricing in the presence of switching costs and network effects; Dennis W. Carlton and Michael Waldman, "The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries," *RAND Journal of Economics* 33, no. 2 (2002), 194–220 (discussing how a monopolist of a primary good may find it profitable to engage in a "virtual tie" by charging a very low price on a complementary product to deter entry when there are network externalities).

666 *See* Section V.B.1.

667 [redacted]

[redacted]

V.B.3.b. Google is able to significantly deviate from competitive behavior in the publisher ad server market

(461) Evidence that Google has substantial and sustained market power in the publisher ad server market includes its ability to meaningfully deviate from competitive behavior in that market without losing significant sales. In a competitive market, a firm loses significant sales if it degrades the quality of its product, all else equal.

(462) [redacted]

(463) [redacted]

(464) Indeed, Google's refusal to allow DFP customers to work on equal terms with rival exchanges as with AdX significantly contributed to the rise of header bidding, which became widely used in the 2014-2015 period.[674] It is notable that during this period, when DFP did not offer publishers the ability to place AdX in competition with real-time bids from rival ad exchanges, publishers resorted to using header bidding (with its associated limitations and complications) rather than switch to another alternative publisher ad server.[675] [redacted]

[671] *See* Section II.

[672] [redacted]

[674] *See* discussion in Section II.E.3 and Appendix L.2.

[675] *See* Sections II.E.3 and Appendix L.2 and L.3 for additional discussion of header bidding.

[redacted]

(465) Moreover, as I described above, when Google made Open Bidding broadly available in 2018, it charged 5-10% for use of this functionality, more than the cost of alternative header bidding tools (as discussed above). In a more competitive market, a rival publisher ad server alternative that enabled publishers to access multiple ad exchanges in real-time would likely have restricted Google's ability to profitably levy such a fee.

V.C. Google possesses substantial and sustained market power in the ad exchange market

(466) Google's ad exchange, AdX, is the largest ad exchange for open-web display transactions, and possesses substantial market power. In this section,

- I first describe how AdX's market power derives in large part from its advantaged treatment by Google Ads and DFP (Section V.C.1).
- I then provide measures of AdX's market shares and discuss barriers to entry and expansion in the ad exchange market (Section V.C.2). AdX is by far the largest exchange in the ad exchange market across a variety of measures. Among worldwide indirect open-web display transactions, I calculate that AdX has maintained a share of over [redacted] Barriers to entry and expansion include significant fixed costs of building, maintaining, and starting an ad exchange; and overcoming network effect and data disadvantages relative to incumbents.
- Last, I provide direct evidence of AdX's market power (Section V.C.3). [redacted] Google's own analyses also indicate that Google could profitably raise AdX's take rate above competitive levels. Moreover, Google's conduct, including its ability to dynamically adjust reserve prices (starting in 2015) and use AdX to favor its own products in the ad tech stack even while degrading the quality of AdX by not submitting real-time bids into rival publisher ad servers, also demonstrate AdX's substantial market power. Such conduct would not be sustainable in a competitive market, as customers would substitute away to comparable alternatives to an extent to make this conduct unprofitable.

(467) Substantial barriers to entry and expansion in the ad exchange market have protected Google's dominant position, and allowed it to maintain a high take rate and take actions that degrade AdX's

676 [redacted]

(475) [redacted]

V.C.2. Indirect evidence of Google's market power in the ad exchange market

(476) Google's high market shares across a variety of measures, as well as evidence of significant barriers to entry, provide indirect evidence of Google's substantial and sustained market power in the ad exchange market.

V.C.2.a. Market shares

(477) [redacted]

(478) [redacted]

[686] *See* Section III.D.1 regarding the persistence of network effects, and Sections VII.D and VII.F.1 regarding AdX's advantages within DFP.

[redacted]

[redacted]

Figure 46. [redacted]

(479) [redacted]

689 [redacted]).

(480) Google's high share in the ad exchange market is also corroborated by data produced in this case. As I show below, market share measures are consistent with AdX possessing substantial and sustained market power in the exchange market.

(481) I present market shares based on impressions, or transactions served, by an ad exchange. As I discussed in Section III.D, via economies of scale and data, scale as measured by the volume of transactions handled by an ad tech product is important for an exchange's competitiveness.[691] [redacted] Although net revenue shares may reflect additional differences in ad tech products' ability to earn fees and returns on investment, they are less directly informative for competitive differences arising from scale effects.

(482) **Impressions.** [redacted]

(483) However, because I do not have access to data from all participants in the ad exchange market, the above share calculation does not contain transactions from those other ad exchanges and hence overstates AdX's share among all ad exchanges. To obtain a rough estimate of the number of transactions served through ad exchanges for which I do not have data, I perform the following calculation.[694] First, I obtain the total number of worldwide indirect open-web display impressions that are purchased through ad exchanges from all bidding tools (DSPs and advertisers ad networks) that produced data sufficient to identify transactions by exchange. I compute that, in the years 2018 – 2022, the exchanges for which I have data represent approximately [redacted] display transactions for this set of bidding tools, excluding DV360 and Google Ads (which meaningfully restrict bidding on non-Google ad exchanges). This figure is greater than [redacted], although the ad exchanges that produced data comprise a substantial share of indirect

691 [redacted]

692 In Appendix D.1.c I also calculate spending (gross revenue) shares and show that they are similar to net revenue shares.

693 *See* Figure 88 in Appendix D.1.

694 I describe this calculation in more detail in Appendix H.

open-web display transactions, there is still likely a meaningful share represented by other ad exchanges.

(484) Following the approach outlined above, I am able estimate the total number of indirect open-web display impressions in each month transacted through ad exchanges that did not produce data using data produced by DSPs and advertiser ad networks.[695] I use these estimates to supplement data produced by ad exchanges and am thus able to estimate the total number of indirect open-web display impressions transacted by ad exchanges in each month.

(485) [redacted]

[695] To estimate the total number of open-web display impresions transacted through ad exchanges that did not produce data on this matter, I use data produced by DSPs and advertiser ad networks that contains [redacted]

[696] [redacted]

Figure 47. [redacted]

Figure 48. [redacted]

(486) Due to data limitations, I am unable to compute reliable ad exchange market shares based on transactions restricted to ad exchange customer locations—i.e., based on transactions involving US open-web publishers or US advertisers.[697] However, I am able to present market shares based on *user locations*—i.e., based on the location of the visitor to a publisher's website. Such share calculations based on user locations can still be informative for at least two reasons.

(487) First, publishers and advertisers in the US may particularly value ad tech products used to buy and sell display advertisements served to *users located in the US*. Consistent with this, a large fraction of open-web display transactions served by US publishers and purchased by US advertisers involve US users. [redacted]

[697] Information on publisher and advertiser geographic locations are missing from data provided by many third-party ad exchanges, advertiser ad networks, and DSPs that produced data in this matter.

[redacted]

(488) Since advertisers and open-web publishers located in the US are thus likely to particularly value ad tech products that are able to effectively serve display ads to US users, an ad tech product's high market share over US users can inform the extent to which that product is attractive to US customers (i.e., US open-web publishers and US advertisers).

(489) Second, I am able to compare market shares based on user locations to those based on customer locations for a subset of exchanges whose data provide information on both publisher and user locations for indirect open-web transactions between 2020 – 2022. [redacted]. I find that impression and net revenue shares among this subset of exchanges are very similar across transactions involving US publishers *or* US users.[700] Hence, even though market shares computed using transactions involving US users are not the same as those computed using transactions involving US publishers, this analysis suggests that they may be close.

(490) Having acknowledged these considerations, I calculate AdX's market share over transactions involving US users across a broader set of ad exchanges, and note that it is also high.[701] [redacted][3]

(491) [redacted]

698 [redacted]

699 [redacted]

700 [redacted]

701 To estimate the size of US-user impressions transacted by ad exchanges that did not produce data, I perform the following exercise: I first compute the the average ratio of impressions for US users relative to impressions for all users among ad exchanges who produced data with sufficient user-geography information. I then apply that average ratio to the estimate of total worldwide impressions for the exchanges who did not produce data at all or who did not produce data with US-user breakdowns. *See* Appendix H.

702 Figures depicting shares based on impressions from US users are contained in Appendix D.1.b.

703 [redacted]

[redacted]

(492) Note that Verizon (Yahoo) shut down its exchange product to open-web publisher inventory in 2023.[705] Excluding Verizon's impressions from the ad exchange market size would provide AdX a 58% share of worldwide impressions and a 48% share of impressions from US users in 2022.[706]

(493) **Net Revenues (Fees).** [redacted]

[704] For robustness, I have analyzed AdX's market shares across several alternative specifications and find that these results are consistent. *See* Figure 89 in Appendix D.1.

[705] Sara Fischer, "Exclusive: Yahoo to lay off more than 20% of staff as it shrinks ad biz," Axios, February 9, 2023, https://www.axios.com/2023/02/09/yahoo-layoffs-2023-tech-media-companies. *See also* YAH_GG_LIT_004590 (06/26/2023).

[706] *See* Figure 88 and Figure 89 in Appendix D.1.a.

Figure 49. [redacted]

(494) [redacted]

[707] [redacted]

Figure 50. [redacted]

Figure 51. [redacted]

(495) [redacted]

V.C.2.b. Barriers to entry and expansion

(496) There are substantial barriers to entry and expansion in the ad exchange market. These include:

- [redacted]

[708] *See* Figure 89 in Appendix D.1.a.

[redacted]

- **Network effects.** Ad exchanges generate value by connecting publisher supply with advertiser demand. Ad exchanges are more highly valued by publishers to the extent they can connect publishers to more advertiser demand and are more highly valued by advertisers to the extent they can connect advertisers to more publisher supply. A new entrant into the ad exchange market lacking access to substantial publisher supply or advertiser demand thus faces a chicken-and-egg problem in building an attractive exchange: publishers will not be willing to incur the costs of establishing a relationship with an exchange without access to substantial demand, and advertisers or their representatives will not be willing to incur the costs developing such a relationship without access to substantial supply.
- **Access to data**. Access to user data gives existing ad exchanges a substantial advantage over new exchanges without access to such data. As I described in Section III.D.3, an ad exchange can provide additional targeting information for a given impression to potential bidders, which can increase an advertiser's value for given impressions, and by extension its willingness to pay, thereby improving publishers' expected monetization from an exchange.[711] Exchanges such as AdX also rely on large-scale data to determine how to dynamically adjust their take rates and improve profitability.[712] [redacted]

[redacted]

[711] *See* Section III.D.3.

[712] *See* Section III.D.3 for further details; Section VII.D.1.b also contains a more detailed discussion of AdX Dynamic Revenue Sharing ("DRS"), which dynamically adjusted take rates.

[713] [redacted]

- **Google's conduct.** Google's conduct has increased barriers to entry and expansion in the ad exchange market by foreclosing rival ad exchanges from Google Ads demand (see Section VII.B) and previously restricting access to dynamic allocation within DFP (see Section VII.D.1).

V.C.3. Direct evidence of Google's market power in the ad exchange market

(497) Direct evidence of Google's substantial and sustained market power in the ad exchange market includes its ability to charge supracompetitive prices (while maintaining a high market share), degrade AdX's quality by limiting unrestricted access and use of its real-time bids to DFP, and vary its revenue share and reserve prices significantly across impressions.

V.C.3.a. Google AdX is able to maintain quality-adjusted prices above competitive levels

(498) Three types of evidence indicate AdX profitably levies supracompetitive fees, and hence that AdX possesses substantial market power. First, Google documents and internal analyses point to its ability to control prices and profitably charge fees above competitive levels without losing a significant amount of its transaction volume. Second, Google and third-party documents indicate that AdX maintains a higher take rate than other exchanges, and has maintained a substantial take rate for years despite reductions in the fees charged by competing ad exchanges. Third, my own analysis of Google and third-party data corroborate AdX's stable and high fees.

(499) [redacted]

[redacted]

(500) Google documents indicate that AdX tranasaction volume from its customers are not highly responsive to fees, and that lower fees would do little to increase market share, but would instead merely reduce AdX revenues, a fact that is, consistent with AdX possessing substantial market power.

(501) [redacted] The elasticity of demand for a product represents the percent change in quantity for a one-percent change in price.[718] The slide shows that the "total blended" average expected elasticity across customer groups is less than 1. This is known in economics as inelastic demand.[719] When demand is inelastic, a one percent change in price leads to a less than one percent change in quantity, implying that a one percent decrease in price reduces total revenues.[720] Consistent with this, the slide states, "[r]educing AdX rev share likely value destroying" for the majority of AdX's publishers with inelastic demand. As a matter of economics, inelastic demand refers to low customer responsiveness to price, and a firm facing inelastic demand at prices above its marginal cost will generally possess significant market power as it can increase prices from competitive levels without losing a large amount of demand.

[717] [redacted]

[718] *See* Hal R. Varian, *Intermediate Microeconomics*, 9th ed. (New York: WW Norton, 2014), 274 ("The price elasticity of demand, ϵ, is defined to be the percent change in quantity divided by the percent change in price.").

[719] *See* Hal R. Varian, *Intermediate Microeconomics*, 9th ed. (New York: WW Norton, 2014), 276 ("If the elasticity is less than 1 in absolute value we say it has an inelastic demand.").

[720] *See* Hal R. Varian, *Intermediate Microeconomics*, 9th ed. (New York: WW Norton, 2014), 279 ("Thus revenue increases when price increases if the elasticity of demand is less than 1 in absolute value."). Analogously, a revenue *decreases* when price *decreases* if the elasticity of demand is less than 1 in absolute value.

Figure 52. [redacted]

(502) [redacted]

721 [redacted]

Figure 53. [redacted]

[redacted]

(503) [redacted]

(504) Additionally,

- [redacted]

[redacted]

(505) Third party documents and depositions also indicate that rival exchanges charged lower take rates than AdX.[727] Moreover, competitors and publishers described an inability to affect or negotiate AdX fees. For example,

- Rubicon's quarterly financial reports indicate that its take rates were lower than Google's in 2018.[728] In 2023 (after Rubicon merged with Telaria and was renamed Magnite), Magnite's Chief

[725] [redacted]

[726] [redacted]

[727] *See also* Sarah Sluis, "OpenX Lays Off 100 Employees And Pivots To Video," AdExchanger, Dec. 18, 2018, https://www.adexchanger.com/platforms/openx-lays-off-100-employees-and-pivots-to-video/ ("To compete, OpenX's competitors have lowered take rates. This strategy disadvantages OpenX which, sources say, often charges fee close to 20%, on par with Google. But Rubicon Project charges 12, and AppNexus averaged 8.5% a year ago."

[728] In particular, Rubicon indicated that its take rate was 11.8% in 2018Q1 (Rubicon Project, *Financial Highlights: Q1 2018*, May 3, 2018: 4, https://investor.magnite.com/static-files/53bd6f86-a6e5-4dd9-af5d-97b60770510e), 12.1% in 2018Q2 (Magnite, "Rubicon Project Reports Second Quarter 2018 Results," August 1, 2018, https://investor.magnite.com/news-releases/news-release-details/rubicon-project-reports-second-quarter-2018-results), 12.3% in 2018Q3 (Magnite, "Rubicon Project Reports Third Quarter 2018 Results," November 7, 2018, https://investor.magnite.com/news-releases/news-release-details/rubicon-project-reports-third-quarter-2018-results), 13.8% in 2018Q4 (The Motley Fool, "The Rubicon Project (RUBI) Q4 2019 Earnings Call Transcript," February 26, 2020, https://www.fool.com/earnings/call-transcripts/2020/02/27/the-rubicon-project-rubi-q4-2019-earnings-call-tra.aspx), and 14% in the full year of 2019 (The Motley Fool, "The Rubicon Project (RUBI) Q4 2019 Earnings Call Transcript," February 26, 2020, https://www.fool.com/earnings/call-transcripts/2020/02/27/the-rubicon-project-rubi-q4-2019-earnings-call-tra.aspx). Several of these financial reports indicate that Rubicon cut take rates between 2017 and 2018 (For example, the report for 2018Q1 indicates that Rubicon's take rate in 2017Q1 was 23.7%. (Rubicon Project, *Financial Highlights: Q1 2018*, May 3, 2018: 4, https://investor.magnite.com/static-files/53bd6f86-a6e5-4dd9-af5d-97b60770510e). In February 2021 (after Rubicon merged with Telaria and was renamed Magnite – *see* Sarah Sluis, "Meet Magnite, The Post-Merger Name For Rubicon Project And Telaria," *AdExchanger,* June 30, 2020, https://www.adexchanger.com/platforms/meet-magnite-the-post-merger-name-for-rubicon-project-and-telaria/) Magnite's CFO stated on the 2020 end-of-year earnings call that "[G]iven the significant and growing competitive

[redacted]

(506) [redacted]

sensitivity related to our take rates, we will not be providing specific ad spend and take rate figures going forward. From a qualitative perspective, however, [our] take rates remain stable" (The Motley Fool, "Magnite, Inc (MGNI) Q4 2020 Earnings Call Transcript," February 24, 2021, https://www.fool.com/earnings/call-transcripts/2021/02/24/magnite-inc-mgni-q4-2020-earnings-call-transcript/).

729 [redacted]

[redacted]

(507) [redacted]

(508) **Analysis of data.** [redacted]

[redacted]

Figure 54. [redacted]

(509) [redacted]

740 [redacted]

Figure 55. [redacted]

(510) The ability of Google to maintain a constant 20% take rate and maintain a high market share in the ad exchange market despite lower fees charged by rivals, and in an industry that observers have described as an increasingly commoditized market,[741] is consistent with AdX's substantial and sustained market power.

[741] *See, e.g.,* Ronan Shields, 'Fundamentally, the SSP business is not very attractive': The fall out of ad tech's latest round of closures," Digiday, February 13, 2023, https://digiday.com/media/fundamentally-the-ssp-business-is-not-very-attractive-the-fall-out-of-ad-techs-latest-round-of-closures/ ("Ari Paparo, founder of Marketecture, told Digiday that Yahoo's cutbacks were to be expected given the ongoing challenges the sellside of the market faces as the buy-side of the industry seeks to downsize the number of players they work with." 'I think that, fundamentally, the SSP business is not very attractive … It's not growing, and it's very competitive as publishers really treat you like a commodity, they have like 10 or 20 of them implemented on every page,' he added. 'And it's becoming less attractive because it's under pressure from the buy-side who's using SPO [supply-path optimization] to reduce the number of paths that they're buying from. And also, you have, advertisers and agencies running bake-offs on the supply side to have preferred relationships, this all favors the biggest SSPs in a consolidating business.'").

V.C.3.b. Google is able to significantly deviate from competitive behavior in the ad exchange market

(511) Evidence that Google has substantial and sustained market power in the ad exchange market includes its ability to meaningfully deviate from competitive behavior in that market.

(512) [redacted]

(513) Google limiting AdX's real-time bids into rival publisher ad servers is consistent with Google's ability to deviate from competitive behavior in the ad exchange market. I discuss this conduct further in Section VII.C.

(514) [redacted].

(515) [redacted]

[742] *See* Section VII.C on Google's exclusive provision of unrestricted access and use of real-time bids from AdX to DFP.

[743] [redacted]

[744] *See* [redacted]

[745] [redacted]

(516) [redacted]

(517) [redacted]

[redacted]

[redacted]

(518) [redacted]

V.D. Google possesses substantial and sustained market power in the advertiser ad network market

(519) Google's advertiser ad network, Google Ads, is the largest advertiser ad network for open-web display advertising, and possesses substantial market power. In this section,

- I first describe key sources of Google's market power in the advertiser ad network market (Section V.D.1), which include its unique access to advertiser demand and publisher inventory (including Google's O&O properties and open-web AdSense publishers) and significant scale advantages over competitors.
- I then provide measures of Google Ads' market shares and discuss barriers to entry and expansion in the advertiser ad network market (Section V.D.2). [redacted]
- Last, I provide direct evidence of Google Ads' market power (Section V.D.3). This includes:

[redacted]

753 [redacted]

754 [redacted]

755 [redacted]

V.D.2.a. Market shares

(526) [redacted]

(527) [redacted]

(528) [redacted]

(529) Below, I present market shares based on impressions and net revenues (see discussion in V.C.2.a).

(530) [redacted]

[redacted]

(531) [redacted]

Figure 56. [redacted]

(532) **Net revenues (fees)**. Google Ads also maintains a significant share of fees collected in the advertiser ad network market. In 2022, Google Ads accounted for 81% of worldwide net revenues from indirect open-web display transactions among Google Ads, Criteo, and FAN.[773] Limiting to fees collected

[redacted] *See* Figure 97 in Appendix D.2.a.

[772] *See* Figure 98 in Appendix D.2.a. [redacted]

[773] *See* Figure 97 in Appendix D.2.a. [redacted]

[redacted]

Figure 57. [redacted]

V.D.2.b. Barriers to entry and expansion

(533) There are substantial barriers to entry and expansion in the ad network market. These include:

- **Access to publisher inventory.** [redacted]

[redacted]

774 *See* Figure 98 in Appendix D.2.a.

[redacted]

- **Scale and data.** [redacted]

- **Google's conduct.** As I discuss in Section VII.F.3, Google's conduct that impaired the competitiveness of non-Google ad exchanges and publisher ad servers impeded rival advertiser ad networks from accessing publisher inventory through non-Google products.

V.D.3. Direct evidence of Google's market power in the advertiser ad network market

(534) Direct evidence of Google's substantial and sustained market power in the advertiser ad network market includes:

- Google Ads' ability to charge supracompetitive fees and vary its targeted margins significantly across impressions, and Google's own analyses indicating that increasing fees would increase profits.
- Google's ability to restrict Google Ads' bidding on non-Google exchanges, thereby degrading the availability of publisher inventory for Google Ads' advertiser customers to benefit AdX.
- Google Ads, by either bidding into or withholding its demand from an ad exchange, meaningfully affects payouts through the exchange.

V.D.3.a. Google Ads is able to maintain supracompetitive fees, and vary its targeted margins to win more auctions, increase profits, and influence publisher behavior

(535) [redacted]

775 [redacted]

776 [redacted]

[redacted]

(536) [redacted]

[redacted]

[redacted]

Figure 58.

(537) Google Ads' market power is also demonstrated by its bidding behavior into AdX auctions.

(538)

(539)

[redacted]

(540) [redacted]

Figure 59. [redacted]

(541) [redacted]

[redacted]

(542) [redacted]

(543) [redacted]

V.D.3.b. Google Ads is able to significantly deviate from competitive behavior in the advertiser ad network market and meaningfully impact publisher payouts

(544) [redacted]

[redacted]

(545) Despite restricting Google Ads' ability to bid through rival ad exchanges, Google Ads has maintained a dominant market share in the advertiser ad network market across a variety of measures. The dominance of Google Ads despite being disadvantaged to strengthen AdX is consistent with Google Ads' possession of substantial market power. This is because, again, in a competitive market, an ad tech product (all else equal) would not likely be able to profitably restrict access to inventory available to its advertiser customers, as doing so would risk losing a large amount of its transaction volume to rivals that did not impose such restrictions.

(546) [redacted]

(547) [redacted]

(548) [redacted]

[redacted]

[redacted]

(549) [redacted]

(550) [redacted]

[redacted]

(551) Combined, these simulation results indicate that Google Ads was and continues to be a uniquely large and important buyer of publisher inventory, meaningfully impacting publisher payouts through its bidding behavior, and supports the conclusion that Google Ads' possesses substantial and sustained market power.

800 [redacted]

(627) [redacted]

(628) [redacted]

(629) I have examined Google Ads' purchasing behavior using data that have been produced in this matter. Since 2014, Google Ads impressions won through non-Google products (i.e., not AdX or AdSense) have not represented a meaningful proportion of Google Ads demand. [redacted] In 2022, [redacted]

880 [redacted]

881 [redacted]

882 [redacted]

883 [redacted]

884 [redacted]

885 [redacted]

886 I conservatively excluded Google owned-and-operated (O&O) properties from these calculations. Including Google O&O properties would increase the denominator and therefore decrease the "non-Google inventory" percentage of Google Ads open-web display impressions. Advertisements placed through Google Ads can appear on Google Finance, Gmail, Blogger and YouTube. *See* Google, "Where your ads can appear", accessed December 17, 2023, https://support.google.com/google-ads/answer/1704373?hl=en.

887 [redacted]

Figure 66. [redacted]

(630) Using Google's log-level data from June 2023, I calculate that AdX's share of Google Ads worldwide indirect open-web display impressions on ad exchanges is [redacted] and third-party exchanges' share is [redacted][888] These data also allow me to examine how competitive Google Ads is when bidding across different exchanges. For this set of impressions, [redacted] This wide difference in "win rates" when Google Ads bids into AdX versus when it bids into a rival ad exchange is consistent with Google Ads' bids into rival exchanges being less competitive than those it submits

[888] Google Ads-AdX log-level data; Google Ads-Third Party Exchange log-level data (see Appendix H.1). I exclude AdSense from the calculation to highlight the share of Google Ads demand that goes to AdX versus non-Google rival ad exchanges; including AdSense would increase the share of Google Ads demand that goes to Google products (AdX or AdSense).

[889] [redacted]

[redacted]

(652) [redacted]

(653) [redacted]

(654) My analysis of the data produced in this case indicates that AdX Direct's significance is also small in more recent years. [redacted]

(655) In Figure 67, I plot the overall share of worldwide AdX open-web display revenue originating from AdX Direct over time. [redacted] (in Figure 67 I show the difference between [redacted]

933 [redacted]

934 [redacted]

935 [redacted]

936 [redacted]

937 [redacted]

938 [redacted]

[redacted]

Figure 67. [redacted]

VII.C.3.b. Hybrid setups still require the use of DFP

(656) Google documents also refer to [redacted][2] However, [redacted]

939 [redacted]
940 [redacted]
941 [redacted]
942 [redacted]

[redacted][5]

(806) As discussed in Section III, transaction fees in the ad tech stack can be analyzed in a manner similar to a value-added tax. The economic literature on tax incidence notes that the burden of a tax will fall on both buyers and sellers as long as neither side of the market perfectly substitutes away in response to a change in price.[1206] Thus, as long as advertisers would not completely substitute away from transacting through ad tech products for a small price increase, and publishers would not completely substitute away for a small payout reduction, the burden of Google's ad tech tax is borne by both sets of customers. In Section IV, I explained why this is likely the case.

(807) Google's experiments and simulations have also indicated that higher margins and fees for Google Ads and AdX harm publishers.

(808) [redacted]

[redacted]

1205 [redacted]

Figure 75. [redacted]

(809) Two other Google experiments and simulations discussed in Section V.D examine the impact of Google Ads' margin on publisher payout. They also indicate that changes in fees in the advertiser ad network market (and not just the exchange market or publisher ad server market) can have a meaningful effect on publisher payout as well, and that an increase in Google Ads' margin harms both publishers and advertisers.

(810) [redacted]

[1210] [redacted]

Figure 76.

(811)

Figure 77:

[1211]

C.2. Summary of differences between digital advertising types

Figure 79. Summary of key differences between digital advertising types for advertisers

Notes: "Typical cost model" reflects costs to both advertisers and publishers. For instance, "CPC-to-CPM" transactions represent transactions in which advertisers pay on a CPC basis and publishers are paid out on a CPM basis. [redacted] See my backup materials. See also Figure 34 in Section IV.E.1.

Sources: 1. Display: IAB Internet Advertising Revenue Report for 2022, available at https://www.iab.com/wp-content/uploads/2023/04/IAB_PwC_Internet_Advertising_Revenue_Report_2022.pdf; Google, "Reach a larger or new audience with Google Display Network Targeting," Google Ads, March 20, 2023, https://ads.google.com/intl/en_us/home/resources/articles/reach-larger-new-audiences/ ("Google Display Network (GDN) targeting allows you to set where or when your ad is shown based on features of your ideal audience, such as their personal interests, age, or gender."); 2. Search: IAB, "Internal Advertising Revenue Report: Full-year 2022 Results", Apr. 2023, https://www.iab.com/wp-content/uploads/2023/04/IAB_PwC_Internet_Advertising_Revenue_Report_2022.pdf; Google, "What's online marketing?" Google Ads Help, https://support.google.com/google-ads/answer/6227161?sjid=7802735466321330464-NA ("When you advertise alongside search results on the Google Search Network, you select keywords to help target your ads to people searching for related terms. … When you advertise on websites that show Google ads (called the Google Display Network), you can get even more specific by choosing the age of the people you want to reach, the types of sites they visit, and their areas of interest."); Google, "Apply and report on Google Ads bid strategies," Search Ads 360 Help, https://support.google.com/searchads/answer/6155651?hl=en; 3. Instream video: https://www.iabuk.com/ctv/glossary; Google, "About targeting for Video campaigns," Google Ads Help, https://support.google.com/google-ads/answer/2454017?hl=enhttps://support.google.com/google-ads/answer/2454017?hl=en ("With a wide variety of targeting methods available to you, such as demographic groups, interests, placements, and your data segments, you can reach specific or niche audiences based on who they are, what they're interested in, or what content they're viewing."), Google, "About video ad formats," Google Ads Help, accessed December 19, 2023, https://support.google.com/google-ads/answer/2375464?hl=en.;

Figure 83. [redacted]

C.4. [redacted]

Figure 84. [redacted]

Figure 85. [redacted]

Figure 86. [redacted]

Figure 87. [redacted]

Appendix D. Additional market shares figures

D.1. Additional exchange shares figures

D.1.a. Summary of exchange shares specifications

Figure 88. [redacted]

D.2. Additional advertiser ad network shares figures

D.2.a. Summary of advertiser ad network shares specifications

Figure 97. [redacted]

Figure 98. [redacted]

D.2.b. US market shares in the advertiser ad network market (baseline)

(847) Below, I include versions of the market shares analyses I presented in my report, limited to impressions served to users in the United States.[1273]

Figure 99. [redacted]

[redacted]

[1273] Due to data limitations, I cannot reliably identify user location in all datasets. See Appendix H.4.a.

D.4. Additional publisher ad-server shares

Figure 107. [redacted]

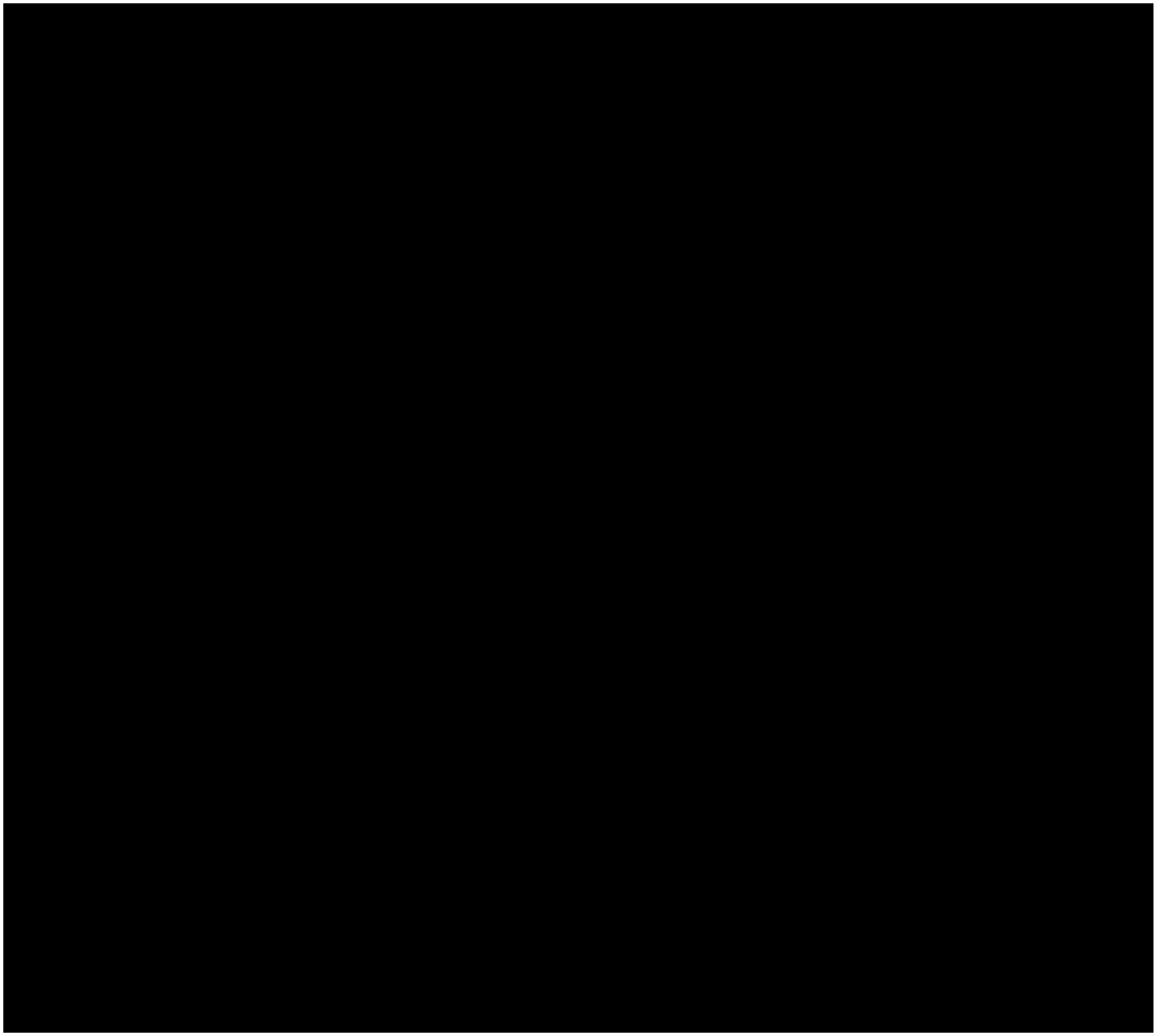

Figure 108. [redacted]

Robin S. Lee, PhD

December 22, 2023

Date